

61537: 616842

(With Charts.)

THE DIAGNOSIS and TREATMENT of GENERAL PARALYSIS

By a NEW SERUM.

Being a Thesis for Degree of M.D. of Edin. University.

By G.Douglas M'Rae, M.B., C.M. & M.R.C.P.E.



The DIAGNOSIS and TREATMENT of GENERAL PARALYSIS

By a NEW SERUM

In 1901 Dr. Ford Robertson and I began a bacteriological investigation into the etiology of General Paralysis. After 2 years' work on the subject we published a paper along with Dr. John Jeffrey in which we produced evidence in support of the hypothesis "that General Paralysis is the result of "a chronic toxic infection from the respiratory and "alimentary tracts, permitted by general and local "impairment of the defences against bacteria, and "dependent upon the excessive development of various "bacterial forms, but especially upon the abundant "growth of a Klebs Löffler bacillus of modified virulence, which gives the disease its special paralytic "character."

Since then we have continued the investigation and we have gained fresh knowledge which has served to convince us more firmly in our original hypothesis. So much so, that in his Morison Lectures last year, which were on the subject of our combined research, Dr. Robertson published the name which we had given to the special diphtheroid bacillus believed by us to be the immediate cause of General Paralysis, viz., Bacillus Paralyticans.

Space will not permit me to go over the evidence upon which our belief is based, but I would like to mention that our present opinion is that General Paralysis is caused by a group of diphtheroid bacilli, which we have shown to be virulent to rats and mice.

In March 1906 we began to subject sheep to the infection of these bacilli with the object of producing an immune serum for the treatment of cases of General Paralysis.

Dr. Ford Robertson has very kindly allowed me to use my portion of our combined research as the subject of this thesis. It comprises the procuring of the serum, giving it to patients and keeping clinical records of the results: I propose to follow this order in my description.

Method of obtaining the Serum.

1. Preparation of the animal to be bled.

The sheep is lifted on to ^a table of my own design, which is so constructed that the animal's feet are a few inches off the ground, while the movements of the legs are considerably restricted on account of the narrow apertures into which they are sunk. The wool over the whole of the front of the neck is next clipped off, the part closely shaved and

thoroughly scrubbed with a solution of 5% Lysol.

2. Tapping the Jugular.

I next wrap a piece of carbolized cotton wool round the left thumb and proceed to make prominent one of the jugular veins by pressure over the vessel low down in the neck. By means of a pair of ^{sterilized} forceps (also made to my design) I grasp by the milled head a large-bore needle (4 to 5 m.m.), previously sterilized in olive oil, and plunge it into the vein, taking care to have the bevelled surface of the needle undermost.

3. Collection and Separation of the Serum.

There is a copious flow of blood which is quickly collected in sterilized 60 c.c. glass tubes handed to me by my colleague, who promptly plugs them with sterile cotton wool, and after being carefully labelled they are set aside in a cool place. In 24 hours, or better, 48 hours the clot has contracted to leave the clear serum, which, without further preparation is ready for use.

It has been found by experience that placing the tubes in a freezing mixture only results in the clotting being impeded and not much serum is formed. Again, the tubes were, by a special device. kept in

a stream of cold tap-water over night, but the degree of contraction of the clot was not improved upon, nor did this method appear to hasten the process.

The amount of serum obtained is usually an exact half of the quantity of blood collected in the tube at the "bleeding" of the sheep. It is convenient therefore to allow 40 c.c. to flow into the tube in order to have the usual amount of 20 c.c. for injection. It is my custom to collect 8 to 10 tube-fuls at each operation, and we find the animals stand it quite well at intervals each of a fortnight.

As soon as the required amount of blood is withdrawn from the animal the needle is quickly removed and the site of the puncture kept pinched for a few moments to "seal" the wound.

After once more swabbing the neck with 5% lysol lotion, the neighbouring wool is neatly plaited over the shaven area and the animal is lifted off the table to walk away apparently quite unaffected by the procedure or loss of blood.

4. Sterilizing of Needle and Serum Syringe.

This is done by means of olive oil as was shown to me by Dr. Stenhouse Williams of the Runcorn Serum Farm, Liverpool.

The method consists in heating filtered olive oil up

to 160° and 180° C. in 2 or 3 minutes, and with needle attached, the syringe is refilled and emptied about a dozen times, while the hot barrel is held by means of a thick towel.

The advantage of this method over water sterilization can only be appreciated when one has to sterilize a number of needles frequently, and the saving of time and labour is an important consideration. One is not hampered by steam, there is no agitation of the fluid as in boiling water and yet there is a considerably greater temperature to ensure thorough sterilization in less time. Moreover the needles being oil-lined do not require to be dried or have a wire kept in them. Clotting also is prevented. To ensure the points of the needles being kept sharp I have devised a metal plate with a series of nipples on which the heads of the needles are placed points upwards. This slips into a dust proof box. I find in sterilizing several needles at the same time it is convenient to leave them in the hot oil while one of them is being flushed through with the syringe, but the metal crucible should not be cup-shaped, since the points of the needles rub against the side and get readily blunted.

It is absolutely imperative to take the syringe to pieces and clean it every morning before sterilizing, if it be an "all-metal" one. These instruments have

copper amalgam in their lining and verdigris is constantly being formed. Some of the local reactions in the beginning of my series of cases I attribute to the unfortunate presence of this substance in the material injected. (Case No. 3 usually was the first to be injected.)

5. Site of Innoculation.

It has been found most convenient to inject under the skin of the abdomen as a situation where the parts are lax, and any increase of tension less disturbing to the patient : there is little muscular movement and with the patient in bed for the rest of the day a dependent position is avoided. On account of the great liability to bed-sores in cases of General Paralysis one instinctively avoids injecting into the posterior aspect.

The skin is thoroughly cleansed by rubbing with a 5% lysol swab and after the pouring on of a few drops of alcohol, is ready for sterile puncture.

The size of the needle is important. I find any calibre much smaller than 1 m.m. is inconvenient, as over-tempered the point of the needle is much more readily blunted and causes pain to the patient and the filling of the syringe is tedious, while air is apt to get in and cause frothing of the serum. The larger-bored needle keeps a sharper cutting point and the syringe is readily filled with an avoidance of air

contamination. My experience has been that the patients distinctly prefer the larger needle to be used, and the greater ease with which the puncture can be made is also an advantage, as no pushing force is required.

After injection the needle is rapidly withdrawn, the region of the puncture is kept pinched for a few moments, and as soon as any oozing has ceased and been swabbed away, a small piece of dry wool is placed against the spot to prevent clothes touching before the wound is thoroughly dried and sealed.

Except in the case of patients whose habits are untidy and the skin constantly unclean I do not believe it necessary to cover with collodion or wool. It is unnecessary to massage the part as the serum is very rapidly absorbed into the lymphatics.

IMMUNIZATION.

Dr. Ford Robertson kindly allows me to make a statement with regard to immunization.

"Bacillus No. I" is one of the Diphtheroid variety isolated from a case of General Paralysis, which stains well by Neisser's method, grows luxuriantly on special Bynohaemoglobin agar, and by Gordon's method produces an acid reaction in glucose broth in 3 days, but not in Saccharose. It is virulent to mice and rats.

"Bacillus No. 2" consists of two strains isolated from a case of tabetic General Paralysis and a case of Tabes, they produce an acid reaction in both glucose and saccharose broths and have the same cultural, emulsionary and microscopic appearances and staining reactions; similarly virulent to No. 1. The animals were regarded as "immunized" when they ceased to react in temperature to regularly repeated and carefully regulated injections (by weight) of the living bacilli, and when the "intra-corporal bacteriolytic index" was raised from 5% to 80 or 90%. I may say that immunization is kept up by continuing the regulated dosage of living bacilli to the animal on the day after "bleeding." We are thus able to maintain a supply of the bactericidal serum by bleeding the sheep at intervals of 10-14 days. Sheep 1 & 2 were immunized to Bacillus No. 1 by June last. Sheep 3 & 4 were immunized to Bacillus No. 1 by October last. Sheep 5 & 6, however, immunized to Bacillus No. 2, were not ready for use till January of this year.

Clinical Records of Cases of General Paralysis
subjected to the Serum.

The first two cases in which serum was used experimentally in small doses of $2\frac{1}{2}$ to 5 c.c. were female General Paralytics in the final stage of the disease. The effect was therefore all the more striking in as much as the patients after injection of serum temporarily became lucid^{and coherent,} and looked less confused, while the tremors became less pronounced and occasionally the speech was free from impairment. In the case of one of them the temperature went up to 99° or 100° F. after each injection.

A third case (Chart 1) was given serum with the object of testing its effect during a congestive seizure in a very advanced stage of the disease. Here again several interesting phenomena were noticed. The temperature, which for 3 months had never been above 99° except in the first week of residence during a slight congestive seizure, was raised after injection of 15 c.c. of serum from Sheep No. 1 from 96.8° to 99.4° within 11 hours. Subsequent smaller doses caused rises to 99° and 101° . The patient recovered from coma; the tremors for a time disappeared, she became quite lucid in mind and was able to talk coherently and rationally to her friends and her articulation

was occasionally free from obvious defect. She however died from exhaustion 15 days after developing the seizure.

A fourth case (Chart 2) which was admitted to the Asylum in a state of advanced Alcoholic Dementia and Paralysis was tested with the specific serum as it appeared to me her articulation and the state of her pupillary reactions pointed to the existence of General Paralysis in addition to the more obvious malady, and moreover she developed a congestive seizure on the 29th January. 20 c.c. of Serum No. I were injected on the 31st Jan. at 11 a.m. The temperature rose from 96.4° to 100° in 11 hours and was sustained between 99° and 100° for 56 hours. Another congestive seizure occurred on the 5th Feb. and on the following day 20 c.c. of the same serum was again injected at 11 a.m. The temperature rose from 97.4° to 100.6° in 11 hours, to fall below normal 12 hours later. Patient developed bedsores and abscesses in the back and died from exhaustion in due course.

Such results in these four cases would seem to suggest the existence of something of a specific nature in this special serum, and afford a distinct indication for its more extended and systematic use. Cases of General Paralysis and other forms of Mental Disease to serve as controls of the experiment were

accordingly selected and these I now propose to describe in detail.

CASE NO. 3. (Chart No. 3)

Catherine Cannon or Simpson, aet. 28. Married, housewife. Admitted to R.E.A. 3rd July 1906.

Disposition. Cheerful and sociable

Habits. Industrious. "Could take a nip or a pot of stout."

Heredity. Mother was bed-ridden and insane. Two brothers intemperate.

Patient married at 19 to husband also 19.

Five children. First born two months after marriage, died at 3rd month; second living and 8 years old, third died aet. 7 weeks, fourth died aet. 13 weeks, fifth died aet. 3 months from Convulsions.

Mrs. S. was first noticed 4 months ago to have loss of speech for 1 hour. Two months ago ordered articles at shops for which she had no need, neglected household duties, was very irritable, going to bed at unreasonable hours and latterly wandering aimlessly.

Was under the care of Dr. Donald, Leith, as a case of General Paralysis for several months.

On admission. She was dull, apathetic, considerably confused in mind and showed defective memory for recent events. Unable to realise her surroundings. Talked in a fatuous and simple way.

The following motor signs of General Paralysis were present - General muscular enfeeblement. Slight Rombergism. Leaning to left side while walking with a stumbling and rolling gait, the right foot being kicked out latterly in a spasmodic fashion. Considerable speech defect- articulation being markedly slurred and slow. Marked tremor in lingual and labial muscles especially during pronunciation of test sentences. Absence of knee jerks. She had slight leucorrhoea.

Progress.

14th July. Much the same, dull and confused.

Memory much impaired. Knits in a very slow fashion.

21st & 23rd July. Menstruated.

31st July. Boroglyceride plugs introduced into vagina for exacerbation of leucorrhoea.

8th August. Vaginal condition much improved.

10th August. Still confused but able to do a little work, such as shaking carpets or sweeping. Paresis of co-ordination in arms prevents her carrying plates. From the 11th to 23rd August patient had "ten congestive seizures." (1) on 11th. Very severe, unconsciousness lasting till 15th, and very marked right-sided twitchings. (2) on 16th, lasting 2 hours. (3) on 17th, lasting 45 minutes. (4) on 18th, lasting 15 minutes. (5) on 19th, lasting half and hour. (6) on the 20th. had a severe seizure at

12.30 p.m. with continuous twitchings of right side of face and complete unconsciousness. Ten ounces of blood were drawn off from the median cephalic vein. Twitchings ceased after 15 minutes but coma continued till 7 p.m. (7) on 21st August, slight seizure with loss of consciousness at 8 a.m. and (8) at 10 a.m., each lasting 15 minutes. (9) on 22nd August, seizure at 9.45 p.m., lasting for 30 minutes. (10) on 23rd August, seizure at 9.30 p.m., lasting 20 minutes. After each seizure articulation was profoundly impaired, patient was very sullen and irritable with great confusion of mind. A flaccid paralysis of right arm and leg remained for a few days after cessation of these epileptiform attacks. At this time she was so exhausted that the friends were warned as to her critical state and she had all the appearance of becoming moribund, deglutition reflex being for a time absent.

3rd Sept. Much stronger and able to be up for a little.

5th Sept. Up all day.

6th Sept. Able to do a little simple housework.

9th Sept. Speech again became very defective, gait more impaired. Dull and irritable.

16th Sept. Passed into congestive seizure which continued till 18th.

20th Sept. Up for 1 hour.

23rd Sept. Leucorrhoeal discharge had become excessive and very foul so that boroglyceride plugging was again resorted to and in five days condition much improved.

On the 26th September the employment of immunized sheep serum was begun, 5 c.c. of B1 S1 being injected into patient's left arm. No reaction was apparent except that on the 28th the patient volunteered the statement that she felt stronger since injection.

29th Sept. 5 c.c. of B1 S2 injected into right arm. No reaction beyond slight superficial erythema at site of injection and a delayed slight rise of temperature on 3rd day to 98.6° F.

4th Oct. 7½ c.c. of B1 S1 given by mouth. At 2 p.m. temperature rose to 99° 8 hours later, subsiding to 97.2° in 28 hours, there being present for a few hours a slight urticaria on upper arms. Pulse increased from 86-90.

7th Oct. 10 c.c. of B1 S2 by mouth at 6 p.m. T. gradually rose to 99° 16 hours later. At 2 p.m. next day slight congestive seizure lasting for 15 minutes with drop in the temperature to 95.6° but a rapid rise to 99.8° at 10 p.m. P. 80-100.

* B1 S1 -Bacillus No. I, Sheep No. I.

* B1 S2 -Bacillus No. I, Sheep No. 2.

9th Oct. Restlessness and headache. T. rapidly falling to 97° at 10 a.m.

10 Oct. Got up.

11th Oct. $7\frac{1}{2}$ c.c. of B1 S1 by mouth at 10 a.m. T. rose from 98.2° to 99° in 12 hours, dropping to 97.4° 4 hours later. Pulse increased from 88-108.

Patient complained of drowsiness during the 12th Oct.

13th Oct. 5 c.c. of B1 S2 by mouth had no effect.

16th Oct. 5 c.c. of B1 S1 injected at 8 a.m. T. steadily rose to 99.4° in 22 hours, dropping to normal in 26 hours. P. increased 80-98.

18th Oct. Patient complained of severe headache, was drowsy, exhibited flushing of face and unsteadiness of gait.

20th Oct. $12\frac{1}{2}$ c.c. of B1 S2 injected at 11 a.m. T. rose to 99° in 3 hours, falling to 97.8° in 23 hours. P. 80-96.

Erythema and oedema of injected arm, lasting 3 days.

28th Oct. Patient said she felt brighter and stronger.

29th Oct. Emotional.

30th Oct. 20 c.c. of B1 S1 S3 injected at 9.30 p.m.

T. went to 98.8° in $8\frac{1}{2}$ hours, dropping to 97.2° in 12 hours. P. nil.

3rd Nov. Steady mental and physical improvement has occurred since serum treatment was begun.

6th Nov. 20 c.c. of B1 S1 S3 injected at 11 a.m.

T. rose to 100.6° in 7 hours, falling steadily to 97° in 23 hours. P. increasing from 90 to 110.

10th-14th Nov. Menstruation occurred, having been absent since 23rd July.

19th Nov. 20 c.c. of B1 S3 S4 injected at 11.30 a.m. T. rose to 102° in $6\frac{1}{2}$ hours, falling steadily to 98° in 27 hours. P. increased 80-100..

Patient vomited at 6 p.m. and complained of much nausea. Marked hard swelling at point of injection next day, which disappeared in 24 hours.

29th Nov. 20 c.c. of B1 S1 injected at 11 a.m.

T. rose to 98.8° in 11 hours, falling to normal in 23 hours. P. 84-94.

Local swelling and redness for a few hours next day.

4th, 5th & 6th Dec. Menstruated.

7th Dec. 20 c.c. of B1 S2 injected at 2.30 p.m.

T. steadily rose to 101° in $19\frac{1}{2}$ hours, falling steadily to 97.8° in $39\frac{1}{2}$ hours. P. 90-96.

14th Dec. 20 c.c. of B1 S4 injected at 11 a.m.

T. rose to 99.4° in 3 hours, fell to 98.2° in 23 hours. P. 82-96.

Patient felt giddy for half an hour immediately after injection.

21st Dec. 20 c.c. of B1 S1 injected at 11 a.m.

T. rose steadily to 100.6° in 11 hours and fell also steadily to 98° in 31 hours. P. 78-98.

29th Dec. 20 c.c. of B1 S1 S2 injected at 10 a.m.

No reaction. The blood in some of the tubes having been frozen by an unexpected keen frost, and serum was formed only after a process of thawing.

3rd, 4th & 5th Jan. 1907. Menstruated

5th Jan. 20 c.c. of B1 S1 S4 injected at 11 a.m.

T. ^{rose to} 99.4° in 19 hours, falling to 97° in 23 hours.

P. 84-92

7th Jan. Slight "congestive attack" represented by twitching in left side of face, pallor and the feeling of "pins and needles" in her arms and legs, this condition lasting for about 20 minutes.

10th, 11th & 12th Jan. Menstruated profusely.

T. rose to 100° at 6 a.m. on the 12th, while patient complained of severe headache.

13th Jan. 20 c.c. of B1 S3 (8 days old) injected at

9 a.m. T. 102° at 6 p.m., sustained to 102.2° at

6 a.m. next day, dropping 4 hours later to 96.2°.

A steady rebound for 16 hours carried the temperature again to 102.4° which fell to normal in 53 hours from time of injection. P. 90-106.

At time of injection face became suffused and livid, with ptosis and swelling of eyelids, sensation of "tightness" in face and patient became alarmed and wept. This passed off in a few minutes

Several hours later she complained of headache and nausea with pains and feelings of "pins and needles" in legs. During the rebound there was profuse diaphoresis.

18th Jan. 20 c.c. of B1 S1 (4 days) injected at 11

a.m. T. rose to 99.4° in 15 hours, dropping 8 hours later to 97°. P. 80-96.

26th Jan. 20 c.c. of NORMAL SHEEP SERUM injected at 12.30 p.m. only effected a drop in temperature to 96° in 21 hours.

31st Jan, 1st, 2nd, 3rd & 4th Feb. Menstruation.

7th Feb. 20 c.c. of B1 S1 (5 days) injected at 11 a.m. T. rose to 100° in 7 hours, falling to 97.8° in 27 hours and remained subnormal for 6 days, while patient worked about the wards. Induration developed at site of injection and a small abscess formed which evacuated itself in a week. P. 80-90.

25th Feb. 20 c.c. of B1 S2 S3 (11 & 9 days) by mouth at noon. T. rose steadily in 10 hours to 99.8°, dropping rapidly to 97° 8 hours later.

About 30 minutes after taking serum patient became very pale. Complained of lightness in the head, and numbness in hands and feet, was hilarious in her demeanour and boasted about her big appetite.

2nd March. 20 c.c. of B1 S1 (10 days) by mouth at 10 a.m. T. rose to 98.8° in 4 hours, dropping immediately to 97°.

Patient said she felt dizzy and hot and that her "head felt like a galvanic battery;" was bathed in perspiration.

Two days later asserted that the last dose of medicine made her feel very much stronger.

11th March. 20 c.c. of B1 S4 (16 days) by mouth at 10 a.m. No change in temperature or pulse, but patient was markedly flushed and complained of headache and drowsiness.

18th March. 20 c.c. of B1 S4 (5 days) by mouth at 9.30 a.m. T. rose to 98.6°. Patient complained of nausea. P. nil.

The result on this occasion was spoilt by the patient taking breakfast immediately after the dose of serum (See Case No. 5) and I am of the opinion that the same cause accounted for the failure of the serum to react on the 11 inst.

23rd-27th March. Menstruation.

25th March. 5 c.c. of B1 S4 (12 days) by mouth at 9 a.m.

Patient "felt a wave of heat through her body."

T. 98.6° at 2 p.m.

CASE NO. 4. (Chart No. 4)

Christina Clark or Millar, aet. 48. Married, housewife. Admitted to R.E.A. 24th June 1906.

Disposition. Cheerful, sociable, warmhearted.

Habits. Very active and industrious. Temperate.

Heredity. None known.

A letter from her doctor accompanied patient on admission with the following clinical history:-

"On Feb. 17 of this year she had an attack of sub-acute rheumatism from which she made a good recovery. While her temperature remained normal her pulse varied from 80 or 90 to 120 per minute. There was no endocarditis, but she showed an increasing amount of nervousness and ultimately her mind became unhinged and she refused her food, neglected the calls of nature, etc. On April 23rd she was certified for removal to Morningside, but as she showed some signs of improvement she was kept at home. The improvement continued till about 10 days ago when she began to have delusions of various kinds and to-day had to be restrained by force." Husband supplemented this report with a few interesting facts. He stated that in April, while still confined to bed, she took "hysterical attacks" with nervous stuttering for an hour at a time: off her food: became very confused, did not know who she was: required enemata and

catheter. A fortnight ago had delusions about debt and of having no clothes: impulsively destructive and hitting the children.

On admission. Confused and bewildered expression, restlessness, movements aimless. Childish, and had limited range of ideas and modes of expressing herself. Doesn't realise where she is nor has she any idea of time. Asserts she cannot tell if she has been married or had children. In appearance a stupid prematurely aged woman. The gait much enfeebled, tending to stamp the heels and to sway when tested for Rombergism. Marked fascicular tremor in lips and tongue with twitchings of forehead and tremors in fingers. Typical Disarthria of G.P. Pupils contracted, irregular, sluggish and limited in their reaction to light and accommodation. Superficial and tendon reflexes all very brisk.

Well marked and offensive leucorrhoea.

Placed in bed in Hospital where she remained a confused, restless, amnesic, bed-ridden General Paralytic, who lay doubled up in bed paying no heed to the calls of nature. The temperature never rising above the normal line.

On the 26th September it was decided to try Serum treatment as there was not the slightest tendency to improvement, the experiment again appearing to be justifiable in this instance as in so many other cases of this "incurable" disease.

26th Sept. 5 c.c. of B1 S1 injected at 10.30 a.m. into right arm. Temperature rose from 96.6° to 98.2° in 8 hours, but the following day it had a short run up to 98.8° and subsided to between 97° and 98° during the next day.

Patient vomited at 6 p.m. for the first time since admission and was very drowsy. P. 74-100.

Wakened up mentally, said "she was tied up in a lump."

29th Sept. 5 c.c. of B1 S2 injected at 3 p.m. into left arm. 3 hours later 5 rose to 99°, then steadily fell in 16 hours to 97.2°, having a sharp rebound to 100° 4 hours later and within 8 hours more dropping to normal, it rose again on the 3rd day to 99.2° at 6 p.m.

She was impulsively violent and did not recognise her daughter who visited her. P. 90-110.

3rd Oct. 2½ c.c. of B1 S2 by mouth at 10 a.m. At 6 p.m. temperature rose to 99.4°, falling to normal at 2 a.m. on the 4th. P. 88-98.

4th Oct. 7½ c.c. of B1 S1 by mouth at 1 p.m. and in 5 hours T. gradually rose to 99.6° and fell to normal 4 hours later, rising again steadily to 100° after

another 16 hours, it dropped suddenly to 97.4° .

Patient very drowsy till following evening after injection. P. 90-96.

7th Oct. 10 c.c. of B1 S2 by mouth at 2 p.m. T. rose from 98.6° to 99.6° 8 hours later, in 4 hours dropped to 98° , rising steadily to 100° 12 hours subsequently, it fell in 4 hours to 98° , and remained subnormal for next 2 days. P. 86-102.

Patient talkative and excited : very confused.

11th Oct. $7\frac{1}{2}$ c.c. of B1 S1 by mouth at 10 a.m. T. rose to 99.2° in 8 hours, falling to normal 4 hours later, steadily rising to 99° after 8 hours, it fell to normal 8 hours later. P. 80-106.

12th Oct. Vomited and was drowsy.

13th Oct. $2\frac{1}{2}$ c.c. of B1 S1 injected at 11 a.m. In 11 hours T. had risen steadily to 99.6° , keeping mostly above 99° for 2 days after, it became normal 67 hours from time of injection. P. 88-100

Excited.

16th Oct. 5 c.c. of B1 S1 injected at 8 a.m. T. rose gradually to 100° in 26 hours, falling to normal 12 hours later. P. 96-112. Drowsiness

19th Oct. Memory improved.

20th Oct. $7\frac{1}{2}$ c.c. of B1 S4 injected at 10.30 a.m. T. rose gradually to 99.4° in 24 hours. P. 86-96.

21st Oct. Temperature was increased by supplementing a further dose of serum by injection of $12\frac{1}{2}$ c.c. of

B1 S4 at 4 p.m. to 99.8° in 2 hours time, remaining about 99° all next day, falling below normal 34 hours after second injection. P. 96-120.

22nd Oct. Patient asserted that she had no feeling in her fingers and that she could not swallow.

23rd Oct. Memory still improving. Still very unsteady on her legs.

24th Oct. 20 c.c. of B1 S1 S3 injected at 6 p.m. T. rose to 99.2° in 12 hours, dropping slowly to normal 44 hours later. P. 100-106.

28th Oct. There was a sharp rise of nearly 3 degrees to 100.4° at 10 a.m. and again to 99.8° at 6 p.m. Next day patient complained of "pins and needles" in hands.

30th Oct. 15 c.c. of B1 S2 S4 injected at 9.30 p.m. T. dodged about the normal line for 2 or 3 points during next 3 days, touching 99° 69 hours after injection. P. 86-102.

3rd Nov. 20 c.c. of B1 S1 S3 injected 4 p.m. In 22 hours T. had slowly risen to 99.4° , dropping to normal 30 hours after injection. P. 90-100

4th Nov. Tremulousness very marked.

6th Nov. 20 c.c. of B1 S1, 3&4 injected at 11 a.m.

T. rose steadily to 99.8° in 11 hours, subsiding to normal 24 hours later. P. 90-106

7th Nov. Drowsiness.

9th Nov. Impulsive.

11th Nov. 20 c.c. of NORMAL SERUM injected at 12 noon. No reaction.

16th Nov. 20 c.c. of B1 S1 S3 injected at noon only showed a rise to 98.6° in 26 hours. P. nil. Serum noticed to be turbid.

19th Nov. 20 c.c. of B1 S2 S3 injected at 11.30 a.m. T. rose to 100° at 6 p.m., falling to normal at 10 p.m. next day. P. 90-96.

23rd Nov. Extreme pallor and tremulousness.

27th Nov. Very jerky in all her movements - cannot hold a cup in hand. Ataxic.

29th Nov. 20 c.c. of B1 S1 injected at 2 p.m. T. rose from 97.6° to 98.8° in 16 hours, returning to normal 12 hours later. P. 86-106.

3rd Dec. Got up for 3 hours.

4th Dec. Up for 4 hours.

5th & 6th Dec. Up for 6 hours each day.

7th Dec. 20 c.c. of B1 S1 injected at 2 p.m. In 8 hours T. had risen to 99.8° , falling to 97.8° at 10 a.m. next day. P. nil.

8th Dec. 15 c.c. of B1 S2 by mouth at 12.30 p.m. augmented temperature by 4 points $1\frac{1}{2}$ hours later, the normal line being regained at 6 a.m. on the 10th. P. 100-108.

11th Dec. Reading a book with intelligence.

14th Dec. 20 c.c. of B1 S4 injected at 11 a.m. T. jumped up and down irregularly for $6\frac{1}{2}$ days afterwards, reaching as high as 100° on second day after injection. P. 86-102.

21st Dec. 10 c.c. of B1 S3 by mouth at 11 a.m. T. rose to 99° in 11 hours and again 20 hours later. P. 90-110.

29th Dec. 20 c.c. of B1 S1 & 2. No reaction, the blood having been frozen as in previous case.

5th Jan. 1907. 20 c.c. of B1 S1 S2 S4 by mouth at 11 a.m. produced a short rise in temperature to 99.4° 7 hours later.

It is to be noticed that serum from sheep No. 4 had been added to that of sheep Nos. 1 & 2, the former only therefore had been the potent serum. (Vide negative reaction on 29th Dec. in this and previous case)

13 th Jan. 20 c.c. of B1 S3 (8 days) injected at 9 a.m. Steady rise of T. to 100° in 13 hours, keeping about 99° all next day, falling to 97.2° 41 hours after injection. P. nil.

15th Jan. Patient much more lucid and conversing with fellow patients.

18th Jan. 20 c.c. of B1 S1 (4 days) injected at 11 a.m. T. rose to 99° in 11 hours, falling to 98.2° within 24 hours after injection. P. 92-102.

28th Jan. 20 c.c. of NORMAL SHEEP SERUM (8) injected at 11 a.m. No change in temperature.

29th Jan. Patient knitting for first time since admission.

1st Feb. 20 c.c. of B1 S3 (9 days) injected at 11 a.m. T. rose steadily to 100.6° in 11 hours,

swinging between 99° and 100.6° for next 12 hours, finally dropped to normal 12 hours later still.

P. 90-106

7th Feb. 20 c.c. of B1 S1 (5 days) injected at

11 a.m. T. rose steadily to 100° in 7 hours,

falling slowly to normal 20 hours later. P. 90-100.

18th Feb. 20 c.c. of B1 S3 (4 days) by mouth at 10

a.m. T. 99.4 at 6 p.m., remaining about 99° for 24

hours, dropping below normal 4 hours later. P. no

change.

Patient felt "sick and dizzy" about half an hour after exhibition of the serum.

25th Feb. 20 c.c. of B1 S2 (9 days) at noon. T.

rose to 100.2° within 2 hours, dropping below normal

12 hours later, with rises to 99° at 2 p.m. and 6 p.m.

on the following days respectively. P. 80-100.

Patient was very much flushed and confused and somewhat exhilarated after drinking serum.

2nd March. 20 c.c. of B1 S4 (7 days) by mouth at

10 a.m. T. rose irregularly to 100° 28 hours later,

falling to normal 56 hours after the dose had been

given. P. 100-110.

Patient was extremely restless and was given 3 drachms of Paraldehyde, but remained sleepless, very restless and intensely confused. Catheter passed and 23 oz. of urine taken off. Required Sulphonal grs. xxx and slept well the following night.

10th March. Patient more lucid and conversing freely.

11th March. 20 c.c. of B1 S2 (33 days) by mouth at 9.30 a.m. T. rose to 98.8° in half an hour. P. 90-96. Patient felt her head "swimming", was squeamish and unable to walk.

12th March. Up all day. Conversing freely and knitting.

16th March. Much brighter and stronger.

18th March. 20 c.c. of B1 S4 (5 days) by mouth at 9.45 a.m. T. rose steadily to 99.4° in $12\frac{1}{2}$ hours, subsiding to 97.6° 4 hours later, in 12 hours again reached 99° , but fell below normal 4 hours later. P. 86-90.

25th March. 5 c.c. of B1 S3 (5 days) by mouth gave no reaction in temperature. P. 80-90.

CASE NO.5. (Chart No. 5)

Susan Gibson or Smythe, aet. 24. Married, housewife.

Admitted to R.E.A. 23rd June 1906.

Disposition. Cheerful but "never much to say" and "easily coaxed."

Habits. Industrious. Drank stout while nursing.

Heredity. Father generally "forgot himself on a Saturday" : died of appendicitis.

Mother had 11 children all of which she nursed for over a year while "supporting herself" with stout : looks alcoholic.

Patient married at 19 having been "put out of the house for late hours". Has had 3 children, aet. 5 years, 3 years and 1 year. Was deserted by husband. Ten weeks ago her two elder children died. Patient, while nursing the third became peculiar, sitting in house and singing to herself. A month ago took to wandering about in the town, being repeatedly brought home. Put on her child's clothing "inside out". Very irritable. Gait "staggery".

On admission. She was confused and dull : memory in abeyance. Could give no account of herself. Her remarks were incoherent and devoid of conscious intelligence. She presented the fatuous expression of a General Paralytic : general muscular enfeeblement and marked defect of equilibration : unsteady gait,

tending to lurch and apt to stump the heels while walking. All reflexes brisk. Fascicular tremor in tongue and lips and tremor of hands. Articulation characteristic. Pupils dilated, irregular in outline, fixed consensually and very sluggish to light. Ham-coloured maculae and satiny scars on buttocks and thighs. (syphilitic)

8th August. Has become greatly confused during past 3 days and much enfeebled physically and on the 12th passed into a very weak and dazed state.

20 Sept. Described as a "bed-ridden progressive "General Paralytic with large bed-sores and very foul "leucorrhoea. Lies huddled up in bed with knees "acutely flexed, extreme motor weakness, general fine "tremor, speech inarticulate and unintelligible." Showed no recognition of relatives who had been sent for, as patient was not expected to live much longer.

16th Oct. Removed to special dormitory for serum treatment, as she has somewhat rallied.

24th Oct. Patient cried a great deal to-day on account of "pains in her legs."

24th Oct. 20 c.c. of B1 S1 S3 injected at 6 p.m. Temperature steadily rose from 98.2° to 100.2° in 20 hours. 5 c.c. of same serum was given by mouth at 2 p.m. (25th) and the temperature remained above 99° during the 26th, kept above 100° on 27th, reaching a

maximum of 100.8° at 6 a.m. on the 28th, fell steadily to normal 24 hours later, when she was noticed to be quite lucid in mind and expressed herself as feeling "better." P. 88-112.

30th Oct. 20 c.c. of B1 S1 S3 injected at 9.30 p.m. T. rose gradually from 97.8° to 99.6° in $16\frac{1}{2}$ hours, and dropped to 98.2° in $24\frac{1}{2}$ hours. P. 80-92.

3rd Nov. Patient complained of "pains" in her legs. 10 c.c. of B1 S1 S3 injected at 4 p.m. T. rose steadily to 99.2° in 14 hours, remaining up for 32 hours and falling gradually to normal at the end of 58 hours from time of injection. P. 84-104.

6th Nov. 20 c.c. of B1 S1 S3 injected at 11 a.m. T. ran up from 97.8° to 100° in 3 hours, kept above 100° for 44 hours, dropping to 99° 8 hours later, gradually rising for following 20 hours to 100.2° , once more falling to 99° , and again rising to 100.2° in 12 hours, finally subsided to normal 20 hours later. P. 88-104.

10th Nov. "Pains" in legs much less severe. Bed-sores healed. Patient can walk a little with support.

11th Nov. 20 c.c. of B1 S3 S4 injected 11 a.m. T. rose to 100° in 7 hours, gradually falling to normal in 36 hours. P. 80-100.

13th Nov. Very emotional.

19th Nov. 20 c.c. of B1 S3 S4 injected at 11.30 a.m. T. rose to 100° in $6\frac{1}{2}$ hours, subsiding to 97.4° 24 hours later. P. 80-96.

24th Nov. 20 c.c. of B1 S1 S2 injected at 11 a.m.

T. rose suddenly at 10 p.m. from 97.4° to 99.4° , in 19 hours it was 100° , remaining up for 8 hours and falling gradually to 98° 43 hours after injection. 8 hours later it reached 101° , arriving at a maximum of 102° 28 hours later, then fell steadily to normal in 20 hours. P. 86-104.

29th Nov. 20 c.c. of B1 S1 injected at 11 a.m.

Gradual rise of temperature to 99° in 11 hours, falling to normal in 27 hours. Pulse nil.

Patient improving mentally and physically and has gained 14 lbs. since being put under observation for treatment.

7th Dec. Since last reaction temperature practically continued subnormal except for a short rise to 98.8° yesterday at 2 p.m.

20 c.c. of B1 S2 injected at 2.30 p.m. T. rose from normal to 100° in $16\frac{1}{2}$ hours, subsiding to 97° 24 hours later. P. 86-96.

12th Dec. Up all day and knitting.

14th Dec. 20 c.c. of B1 S4 injected at 11 a.m.

T. rose steadily to 100° in 7 hours, sustained for 8 hours and then falling to normal within 24 hours from injection. P. nil.

18th Dec. Up all day. Gait very much improved.

21st Dec. Temperature being subnormal for past 5 days 20 c.c. of B1 S1 were injected at 11 a.m. T. rose a degree every 4 hours to 101° 11 hours later, gradually subsiding with slight oscillations on the 5th day after injection. P. 84-98.

29th Dec. 20 c.c. of B1 S1 S2 injected at 11 a.m. T. continued below 97° but suddenly rose to 100.40 at the end of 31 hours, dropping to 97° again within 4 hours. It rose progressively for next 5 days with oscillations of 3 degrees to reach a maximum of 102° , falling to 100° 16 hours later, when the following injection was given : P. 84-100.

5th Jan. 1907. 20 c.c. of B1 S1 S4 at 11 a.m. A rise of 1 degree to 101.2° occurred in 4 hours, sustained for 16 hours more and fell by short swings to below the normal line in 59 hours from time of last injection and remaining subnormal subsequently. Some diffuse induration at point of injection on 6th inst. had gone on 7th. P. nil.

13th Jan. 20 c.c. of B1 S3 (8 days old) injected at 9 a.m. T. rose from 97° to 99.8° in 9 hours, falling steadily to 97° in 39 hours. P. nil.

18th Jan. 20 c.c. of B1 S2 (9 days) injected at 11 a.m.

Immediately after injection the face became very flushed and patient complained of a tight feeling in the face : became alarmed and wept. T. rose steadily to 101.8° in 7 hours, with a short downward swing, it continued to rise till 103.4° was reached 43 hours after injection, then sank to normal about 32 hours later. P. 96-100.

22nd Jan. Patient is now able to dress and undress herself, dine at table and walk without aid.

25th Jan. Vaginal mucosa normal.

28th Jan. 20 c.c. of NORMAL SHEEP SERUM injected at 11 a.m. resulted in no temperature or pulse change.

30th Jan. Patient complained of "shooting pains" in shoulders.

1st Feb. 20 c.c. of B1 S3 (9 days) injected at 11 a.m. T. rose steadily to 101° in 11 hours, falling gradually to 97° 16 hours later and with swings to 99.8° and 99.6° , finally subsided to 97° 51 hours after injection. P. 86-100.

7th Feb. 20 c.c. of B1 S1 (5 days) injected at 11 a.m. T. rose from 97° steadily to 100.8° in 15 hours, dropping to about 99° 12 hours later and with oscillations to 100° and 99.8° finally settled to normal 85 hours after injection. P. 84-96.

12th Feb. Patient working in the wards.

18th Feb. 20 c.c. of B1 S3 (4 days) by mouth at 10 a.m. T. rose to 100° in 8 hours, gradually falling

to normal in 32 hours. P. 80-96.

Within half an hour of administration patient says a wave of heat came over her and it seemed as if her head would burst, she became bathed with perspiration and looked like one intoxicated with alcohol.

Said in the evening that she felt her legs very much stronger since the "medicine."

25th Feb. 20 c.c. of B1 S2 (9 days) by mouth at noon.

(Shortly afterwards patient became very pale and felt dazed for a short time.) T. rose steadily to 100° in 10 hours where it remained for 8 hours, falling to 97° in 4 hours, gradually rose to 100.6° 16 hours later and after 12 hours subsided to normal, only to shoot up to 102.2° at the end of other 16 hours, falling gradually to normal after a further period of 32 hours. P. 84-96.

28th Feb. Able to dance at weekly ball.

2nd March. 10 c.c. of B1 S1 (10 days) by mouth at 9 a.m. only resulted in a rise to 98.6° . The patient

The patient by mistake partook of breakfast immediately after dose of serum, having developed an inordinate appetite. Felt powerless and dizzy, showed extreme pallor with marked diaphoresis. P. 84-96.

5th March. Urticaria on hands and arms.

11th March. 20 c.c. of B1 S4 (16 days) at 9 a.m. by mouth. T- rose steadily to 100° in 9 hours, 20 hours later had fallen steadily to 97.2° to rise

rapidly to 102.2° within the next 8 hours, and during the next 4 days showing irregular oscillations between 97° and 102.2° , ceasing to swing after 151 hours of pyrexia. Patient complained of drowsiness and general muscular weakness and was so sleepy that she had to go to bed. Next day continued drowsy. The three highest swings of temperature occurred at 10 p.m. on 2nd, 4th & 5th day of the pyrexia. P. 88-96.

18th March. 10 c.c. of B1 S1 (9 days) at 9.30 a.m. by mouth. T. only reacted to 98.6° in $8\frac{1}{2}$ hours, but patient complained of being dazed and giddy. P. 78-90. As in Case No. 3 by the partaking of breakfast immediately after the dose of serum the result has been vitiated.

19th March. Feels "ever so much stronger and could do any amount of work."

25th March. 5 c.c. of B1 S4 (12 days) by mouth at 9 a.m. T. rose to 98.8° in 9 hours and oscillated for 4 more days between 96° and 100° . P. 84-92.

Patient complained of drowsiness.

C A S E NO. 6 (Chart No. 6)

Mary Jane Greenlaw or Bathgate, aet. 39. Married
for 8 years. No children. Admitted to R.E.A.
9th October 1905.

Disposition. Cheerful and sociable.

Habits. Extremely temperate.

Heredity. Mother in an asylum and had "Paralysis"
with delusions of grandeur.

Father died of Locomotor Ataxia, having been nursed
by patient for 12 years.

Patient became dull a year ago and during the past
3 months declared she could do no work. Lost flesh
five weeks ago and went off her sleep. Had the
delusion her clothes were dirty. Very confused.
Last week impulsively bought paraffin oil, poured it
over a bag which she set on fire. Certified to have
"delusions that she was being poisoned with an 'evil
'spirit', and that she feels 'dead to all around her'.
"Careless and indifferent in ordinary duties. Had
"impulses of destruction, etc."

On admission. Patient exhibited considerable con-
fusion : appeared to be in a dazed state. Could not
understand what was said to her and had the greatest
difficulty in expressing her thoughts. Resisted
having her clothes taken off and put on. Noisy,
restless, excited. Incoherent babbling in a strain

of negation, e.g., "No clothes, no food, no seats, no fires, no people should be here," and took the clothing from other patients.

Pupils dilated and irregular. Marked tremor of face and tongue. Coarse twitchings in hands. Knee jerks much increased. Speech rather blurred. Gait sloven and unsteady.

15th Oct. Developed an acute attack of frenzied excitement, screaming, jumping, twisting and struggling violently and was given Hyoscyne gr. 1/75 hypodermically to subdue her dangerous excitement which had required 4 nurses to restrain.

31st Jan. 1906. Passed into an apathetic, dull and asocial state : scarcely can be got to express her-
even
self in monosyllables. Wets her clothing.

20th June. This patient has become progressively more weak-minded and degraded in her mental state. intensely stupid and utterly neglecting the calls of nature. Her gait is now markedly paretic. She cannot stand unsupported. There is general muscular wasting and the knee jerks are abolished. The pupils irregular in outline, contracted and sluggish. Marked tremor in facial and lingual muscles. Articulation mumbling, indistinct and very unsteady.

There is a very foul leucorrhoea.

Has lost 19 lbs. in weight.

4th August. Patient had been tested with hypodermic injections of toxins prepared from diphtheroid bacilli isolated from cases of General Paralysis and had shown a very distinct reaction to the one from which Serum No. 1 was prepared but scarcely at all to that of Serum No. 2.

23rd Oct. Five weeks ago patient had toxins of Bacillus No. 1 injected on two occasions, the temperature reacted once more and after 3 weeks' irregularity it has become steadier for past fortnight and it is decided to commence Serum treatment

24th Oct. 20 c.c. of B1 S1 S3 injected at 6 p.m. Temperature steadily rose to 99.4° in 20 hours and as steadily fell to normal 16 hours later. Pulse increased from 98-106.

31st Oct. 20 c.c. of B1 S1 S3 injected at 9.30 p.m. T. rose to 99.2° in $21\frac{1}{2}$ hours, dropping to normal within 4 hours. P. no change.

2nd Nov. Restless during the day.

3rd Nov. 20 c.c. of B1 S1 S3 injected at 4 p.m. T. rose steadily from 97° to 99.4° in 14 hours, dropped to 98° after 6 hours, and 12 hours later went up to 99.2° to drop to normal within 4 hours. P. 90-100.

4th Nov. Restless and talkative.

6th Nov. 20 c.c. of B1 S1 S3 injected at 11 a.m.

T. rose to 99.2° in 7 hours and after dropping a degree reached 99.6° in other 12 hours, to drop to normal 8 hours later. P. 96-106.

7th Nov. Patient excited during the day.

11th Nov. 20 c.c. of NORMAL SERUM injected at

12 noon. T. no reaction. P. nil.

16th Nov. 20 c.c. of B1 S1 S3 injected at 12 noon.

T. rose from 97.4° to 99° in 6 hours, dropping to 97° within 8 hours later. P. 78-90.

Temperature below 98° for next 2 days.

19th Nov. 20 c.c. of B1 S3 S4 injected at 11.30

a.m. T. rose from 97.6° to 99.6° in $6\frac{1}{2}$ hours and with short oscillations sank to 98° in $34\frac{1}{2}$ hours from time of injection. P. 90-96.

20th Nov. Patient restless and talkative.

21st Nov. Able to be up for 1 hour.

22nd Nov. Coherent. Up for 2 hours. Gait improving.

29th Nov. 20 c.c. of B1 S1 injected at 11 a.m.

T. rose to 99° in 3 hours and remained about 2 points above normal for 20 hours. P. 86-90.

7th Dec. 20 c.c. of B1 S2 injected at 2 p.m.
to 99°

T. rose in 4 hours [^] and 8 hours later was 99.4° , remained above 99° for 12 hours more, then fell to 97.2° within 4 hours later. P. 96-100.

From the 10th to 14th Nov. the temperature kept steady about 98° and patient was able to be up all day and knitting.

14th Dec. 20 c.c. of B1 S4 injected at 11 a.m.

T. rose in 3 hours to 100° , fell to 99° in 4 hours, where it remained for other 12 hours to fall to normal 23 hours after injection. P. nil.

21st Dec. 20 c.c. of B1 S3 injected at 11 a.m.

T. rose steadily to 99.8° in 11 hours, remaining at 99.6° for the next 8 hours, fell to normal after the lapse of other 8 hours. P. 90-98.

22nd Dec. Patient conversed with nurse and memory noticed to be fairly good.

From 23rd Dec. to 4 Jan. 1907 the temperature hovered about the normal line, occasionally rising to 99° or falling to 97° , the pulse varying from 80 to 96.

5th Jan. 20 c.c. of B1 S4 injected at 11 a.m. T. rose from 97.8° to 101° in 7 hours, dropping to 97.4° in the next 4 hours, steadily rising to 99.8° in 12 hours, fell to normal at the end of other 12 hours. P. 84-92.

For the next week the temperature was very irregular, shooting up to 99.8° .
on the 10th Jan. ^ This might be accounted for by a recurrence of foul leucorrhoea during temporary absence of usual nurse.

13th Jan. At 2 a.m. patient's temperature was 100.49

at 6 a.m. 98°⁰, at 10 a.m. 98.20°. 20 c.c. of B1 S2 (4 days old) were injected at 9 a.m. In 5 hours the temperature had run up to 102.20° and 4 hours later to 103°⁰, dropping steadily during the next 24 hours to normal. P. 84-116.

It may be that the patient was absorbing toxins from the vaginal mucous membrane during the week above described. Careful douching and plugging with boro-glyceride swabs presumably removed the organisms and toxins, and other bacilli which may have been or lying higher up invading the tissues were destroyed by the serum, and a flood of toxins was let loose to cause a considerable rise in temperature of over 4½ degrees. For the next two days the temperature remained below normal. Compare Cases 5, 7, 9, 14.

18th Jan. 20 c.c. of B1 S1 (4 days) injected at 10 a.m. T. rose from 97.20° to 98.8° in 12 hours, falling to 98.20° in other 12 hours and after rising to 99.6° 12 hours later fell to 97.6° within 8 hours. P. 90-96.

28th Jan. 15 c.c. of NORMAL SHEEP SERUM (8) injected at 11 a.m. Temperature did not rise above 98° during the next 4 days. Pulse varied between 80 and 96 but quite irregularly and had been 90-96 the previous day.

1st Feb. 20 c.c. of B2 S5 injected at 11 a.m. T. rose steadily to 100° in 11 hours, falling below normal 16 hours later to rise to 99° in 8 hours, where it remained for other 12 hours, to fall to 98.2° within the next 4 hours. P. 90-92.

Temperature remained below 98° for next 3 days.

7th Feb. 20 c.c. of B2 S5 (2 days) injected at 11 a.m. T. rose steadily to 100° in 7 hours, falling to normal in next 12 hours. P. 80-92.

For next 9 days the temperature remained below the normal line. Pulse variable.

18th Feb. 20 c.c. of B1 S3 (4 days) by mouth at 10 a.m.

T. rose steadily from 97.6° to 99.6° in 11 hours, falling to normal in the next 16 hours. P. 88-96.

Patient said she felt "dizzy".

During the following 5 days slight irregularity of temperature occurred, varying from 97° - 99° .

25th Feb. 20 c.c. of B2 S5 (20 days) by mouth at 12 noon. T. in 6 hours was 99.2° where it remained for 4 hours and then fell to normal within the next 4 hours. T. was irregular for the next 3 days, rising twice to 99.6° . P. 84-90.

After taking the serum patient asserted she felt "funny" but could not describe it.

2nd March. 20 c.c. of B1 S4 (7 days) by mouth at 10 a.m. T. rose steadily to 101.2° in 12 hours, dropping to normal 4 hours later, in 6 hours rising to

99.4°, normal again in 4 hours, and 99° during the next 12 hours and after 8 hours at 98° took a steady rise up to 100.6°, falling to 97° 8 hours later. P. nil. Patient complained of nausea after taking the serum.

11th March. 20 c.c. of B1 S2 (33 days) by mouth at 10 a.m. T. rose to 98.8° in 8 hours, falling steadily to 96.8° in next 12 hours, to rise gradually to 99.4° in 16 hours, and dropping below normal in the next 4 hours. P. 90-96.

18th March. 20 c.c. of B1 S4 (5 days) by mouth at 9.45 a.m. T. rose from 97.6° to 100° in 8 hours, dropping below normal within the next 8 hours. P. nil. Temperature was very irregular for the next 6 days, showing daily rises in decreasing height from 100° to 99°.

25th March. 5 c.c. of B1 S3 (10 days) at 9 a.m. T. rose steadily to 101° in 9 hours, dropping to 97.6° in next 12 hours, running up again to 99.6° during the next 16 hours and falling to 97° 4 hours later. Daily oscillations from 2 to 3 degrees and as high as 99.6° occurred during the next 3 days. P. 80-86.

C A S E NO. 7. (Chart No. 7.)

Elizabeth Wilkinson, aet. 44, single.

Admitted to R.E. A. 22nd May 1905.

Disposition. Mild and good-natured. Energetic as a rule, sometimes moody.

Habits. No history of intemperance.

Heredity. Mother was weak-minded and treated in a poorhouse.

Patient was sent to Asylum with the following certificate : "Such a state of mental debility that "she does not know where she is or what she has been "doing; she is quite reticent; only giggles and "laughs if spoken to."

On admission. She exhibited well marked enfeeble - ment of mind : not appearing to understand the simplest questions. Expressionless beam on face. Can scarcely articulate her own name, speech unintelligible. Marked general fine tremor and somewhat rhythmic jactatory tremor of arms. Reflexes all exaggerated. Pupils unequal, very irregular and sluggish to light and accommodation.

Abdomen presents lin^e_æ albicantes and there is a pronounced leucorrhoeal discharge which was found to be loaded with diphtheroid bacilli.

In December 1906 patient had a congestive attack which lasted about 3 weeks. Temperature oscillated

between 99° and 103° for one week. She got over this but remained in much the same crippled mental state as on admission.

It being decided to test patient with the Specific Serum a 4 hourly chart was begun on the 22nd January 1907. The temperature was below the normal line for the rest of the month.

1st Feb. 20 c.c. of B2 S5 injected at 11 a.m. 3 hours later the T. rose to 99.2° , rising to 99.6° in other 4 hours, remaining above 99.4° for next 8 hours, 4 hours later it rose to 100.8° and reached 101.2° at 10 a.m., dropping to 98.6° in 4 hours and after a rebound to 99.4° for the next 12 hours it became normal at 6 a.m. on the 3rd, or, 43 hours after injection. P. 80-104.

7th Feb. 15 c.c. of B1 S2 (9 days old) injected at 11 a.m. Within 3 hours the T. had sharply risen to 102.2° , in other 4 hours it rose to 103° and reached 103.6° at 10 p.m. It then subsided to 101° at 10 a.m. next day (12 hours), with a jump up to 102.2° at 2 p.m., it fell to be sustained at 101° for the next 12 hours, dropped to 100° 8 hours later and back to 101° in 4 hours, to subside at length to normal at the end of other 20 hours. P. 84-100

Patient was very flushed, complained much of thirst and vomited at 6 p.m.

18th Feb. 20 c.c. of B1 S2 (20 days) by mouth at 10 a.m. From 97.6° T. rose gradually to 99.6° in 11 hours, kept above 99° for next 12 hours, falling to normal 4 hours later. For the next 3 days it was somewhat irregular and only fell by successive oscillations up to 99.6° , 99° and 98.8° to normal after $4\frac{1}{2}$ days reaction. P. 80-90.

Patient again complained of extreme thirst and looked extremely pale.

25th Feb. 20 c.c. of B1 S2 (9 days) by mouth at noon. At 2 p.m. T. was 99.4° , 99.6° 4 hours later, 99° at 10 p.m. and 99.8° at 2 a.m. on the 26th. Falling to 97.6° in 4 hours it gradually rose to 99° 8 hours later, to fall finally below normal 36 hours after injection. P. 86-90.

28th Feb. Patient very emotional.

2nd March. 20 c.c. of B1 S4 (7 days) by mouth at 10 a.m. Four hours later T. was 98.8° and in other 4 hours it had regained a subnormal state. P. nil. Immediately after taking the serum patient became very pale, complained of giddiness and she developed diarrhoea.

5th March. Patient says "she feels much better."

8th March. Patient has been assisting in ward work. Is brighter and not so tremulous. T. at 6 a.m. took a short-lived excursion to 99.8° for no apparent reason.

11th March. 20 c.c. of B1 S3 (12 days) by mouth at 10 a.m. only resulted in a rise to 98.6° at end of 4 hours, T. falling below normal 12 hours after injection. P. nil.

18th March. 20 c.c. of B1 S1 S4 (9 days & 5 days) by mouth at 9.30 a.m. At 10 p.m. T. had gradually risen from 97.4° to 99° , to fall below normal line 4 hours later. P. 80-86.

25th March. 5 c.c. of B1 S3 (10 days) by mouth at 9 a.m. T. actually rose above normal line at 98.6° for 4 hours within 5 hours of administration. P. nil.

1st April. Coagulum of B1 S1 corresponding to 20 c.c. of serum, given by mouth. T. rose to 98.8° 27 hours later. P. 70-86.

8th April. 20 c.c. of B1 S3 (9 days) injection at 10.30 a.m. T. rose from 97.4° to 99.8° in $10\frac{1}{2}$ hours, after a fall in other 12 hours to 97.4° , it rose in 8 hours to 101° , falling below normal after the lapse of other 36 hours. P. 80-104.

Flushing of face and increased tremulousness.

C A S E NO. 8. (Chart No. 8)

Jessie Henderson, aet. 48. Widow. Admitted to
R.E.A. 5th July 1906.

Disposition. Excitable and nervous.

Habits. Alcoholic excess for last 6 years since
death of husband. Loose life for some 4 or 5 years.

Heredity. Maternal aunt was insane.

Some weeks ago patient became depressed and greatly
disturbed by a sense of wrong-doing. Certified as
"Very melancholic. Memory poor and confused :
"rambles disconnectedly. Admits having attempted to
"strangle herself . . . "

On admission. "Exhibited very great depression,
moaning and sighing continually. Restless and very
confused. Absolutely taciturn. Gait slow and
uncertain. Slight wincing when calves were firmly
pressed. Knee jerks abolished." No note is made
as to tremor or the condition of the pupils. Patient
continued depressed till September when she began to
improve mentally and physically. During October she
appeared to be on the way to convalescence and was
brighter and able to employ herself under supervision
in the wards. On the 12th Nov. she became confused,
excited, restless and talkative , and she continued
more or less in this maniacal state during the month

of December.

Early in January patient began to show marked unsteadiness of gait - leaning and lurching to left side. There was marked tremor of lips, face and tongue and the articulation was very distinctly affected. She slurred and stumbled in test sentences. She remained in a childishly hilarious and confused state, restless, very garrulous, incoherent and quite unable to apply herself to any rational occupation. Pupils unequal, slightly irregular and showed a limited and sluggish reaction to light and accommodation. Knee jerks still absent.

1st Feb. 1907. Put on a 4 hourly chart as it has been decided to test her with serum.

4th Feb. Temperature has been subnormal for past 3 days. Patient was to-day injected with 20 c.c. of B1 S2 (6 days old) at 11 a.m. T. rose gradually from 97.6° to 99.4° in 11 hours, and fell steadily to normal at 2 p.m. next day. After a further fall to 97.6° in 4 hours, it rose to 99.6° in other 8 hours, to regain the normal line 4 hours after that. P. 88-96. Slight swelling at point of injection in the evening was all the local effect noticed.

5th Feb. Patient volunteered the information that "she felt less nervous than she had been for a long time." This was the first time she had ever sanely

expressed her "state of mind" to any one since admission.

7th Feb. 20 c.c. of B1 S1 (5 days) injected at 11 a.m. T. rose steadily to 100° by 10 p.m., falling gradually to normal at 10 a.m. next day. P. 84-96.

13th Feb. Slight urticaria on arms, face and trunk. Temperature, however, did not rise above the normal line.

18th Feb. 20 c.c. of B1 S3 by mouth at 10 a.m. T. rose steadily from 97.6° to 99.6° at 10 p.m., falling gradually below normal at 2 p.m. next day. P. nil. Half an hour after the administration of the serum patient became very flushed and then pale, complained of "tightness in her face" and kept saying "It is away to my head," was bathed in perspiration and looked as if she were going to faint. This condition lasted for about 10 minutes.

24th Feb. 20 c.c. of B1 S1 injected at noon. T. went to 99° at 2 p.m., remained there for next 4 hours, to drop to normal by 10 p.m. P. 86-90. Patient was flushed in face and "felt like going under chloroform." Later, became hilariously excited, was bathed in perspiration and developed a voracious appetite.

25th Feb. About 11.10 a.m. patient appeared very faint, complained of dark haze before the eyes and giddiness. She then burst into a profuse perspiration.

asserted she had "two faint turns" during the night with breathlessness.

28th Feb. Patient says she "feels like a new woman" and ascribes this improvement to the serum.

2nd March. 20 c.c. of B1 S4 by mouth at 10 a.m.

(7 days). T. only rose to 98.6° at 2 p.m. and returned to 97.6° within 4 hours later. P. nil.

Patient felt "very squeamish and dizzy", showed profuse diaphoresis and had several loose motions.

3rd March. Complained of slight breathlessness.

4th March. Working hard all day in the wards.

5th March. Taking cook's place in the kitchen during afternoon - her work consisting of preparing nurses' and patients' tea - and she cooked the nurses' supper.

8th March. Conducts herself quite rationally.

11th March. 20 c.c. of B1 S3 (12 days) by mouth.

T. only touched 98.6° at 6 p.m.

On the 2nd, 3rd & 4th days it had risen to 98.6° in the evenings. P. 90-96.

15th March. Doing all the cook's work in the kitchen. Quite rational and free from emotional disturbance

18th March. 20 c.c. of B2 S5 by mouth at 9 a.m.

resulted only in a rise to 98.6° by 12 noon, maintained at 2 p.m., to fall to normal by 6 p.m. P. 80-86. Like Cases 3 & 5, she also had breakfast immediately after taking the serum.

25th March. 5 c.c. of B1 S4 by mouth at 9 a.m. T. failed to rise above the normal line.

C A S E NO. 9. (Chart No. 9)

Helen Norrie or Hutchison , aet 37. Widow.

Admitted to R.E.A. 2nd August 1906.

No history obtained in this case.

Certified as - "Dejected, dull and stupid appearance :
"sits with hands crossed and takes no interest in her
"surroundings : unable to converse or answer simple
"questions : has lost her memory."

On admission. Dull and apathetic. Answers questions
in a casual and contradictory manner. Memory uncertain and unreliable. Cannot tell when her husband died or how many children she had. Evidence of gross negligence of personal cleanliness.

General muscular condition very flabby. Knee jerks exaggerated and the pupils unequal and irregular.

Slovenly articulation and slouching gait.

Patient continued in a stupid, indolent, apathetic state till February when she was again examined and found to exhibit marked fascicular twitchings in facial muscles : ataxic unsteadiness of tongue and gross defect of articulation : very irregular, unequal and sluggish pupils : stumbling paretic gait, with inability to stand on one leg and marked exaggeration of knee jerks.

She had also a very foul leucorrhoea and was utterly negligent in the calls of nature.

4th Feb 1907. 20 c.c. of B1 S2 (24 days) injected at 11 a.m. T. rose steadily from 98° to 101° in 7 hours, to fall gradually to 98.8° in 8 hours, where it remained for the next 12 hours; rising again to 100.4° in other 4 hours, it subsided to normal 16 hours later. P. 84-96.

7th Feb. 20 c.c. of B1 S4 (2 days) injected at 11 a.m. T. rose from 98.2° to 101° in 7 hours, to fall to 98.8° 12 hours later, and rising slightly for the next 8 hours, fell to normal in 31 hours. P. 86-96.

10th Feb. The temperature oscillated about 100° , also on the 14th & 16th, there being slight urticaria on arms and trunk.

18th Feb. 20 c.c. of B1 S2 S4 (20 & 13 days old) by mouth at 10 a.m. T. rose from 98° to 100.4° in 8 hours, dropping gradually to normal in 32 hours, but continued to oscillate even as high as 101° for the next 4 days. P. 90-96.

Shortly after taking the serum patient made her first coherent statement to the effect that she "felt very dizzy and thought her head was jumping off the pillow." The temperature having been settled for past 24 hours she was next day -

23rd Feb. given 20 c.c. of B2 S6 (20 days) by mouth at noon. T. rose from 98.2° to 100° in 8 hours, to drop to 98° 18 hours after administration. P. 84-90.

The temperature continued irregular for next 3 days but under the 99° line.

1st March. Patient was up all day and employed herself for the first time since admission (August 1906) in knitting.

2nd March 20 c.c. of B1 S4 (7 days) by mouth at 10 a.m. T. rose from 98° to 99.2° in 8 hours, sustained for the next 8 hours, to fall to normal 4 hours later. P. nil.

Patient said after taking the serum that she "felt drunk" and she had profuse diaphoresis.

There were rises to 99.8° and 100.6° on the two succeeding days but after this the temperature, though irregular, kept once more below the 99° line.

4th March. Patient much brighter mentally and taking part in general conversation.

8th March. Patient could be trusted to carry messages for the nurses.

11th March. 20 c.c. of B1 S2 (5 days) by mouth at 10 a.m. T. rose from 98° to 99.8° in 4 hours, was at 100° in other 4 hours, remained above 99.6° for next 8 hours, to drop to 97.6° 20 hours after the dose of serum was given. P. 90-98.

Patient complained of being very hungry.

It took four days for the temperature to steady down, pulse as usual continued to be very irregular.

18th March. 15 c.c. of B2 S5 S6 (6 & 6 days) by mouth at 9.30 a.m. T. rose steadily from 98° to 100° in 8½ hours, dropping to normal 4 hours later. P. 86-96.

The temperature continued very irregular, often up to 100° since that day.

1st April. Patient is much stronger and takes part in general ward work and amusements. She can now give an account of herself and is noticed by her own relatives to have made a very distinct improvement.

C A S E NO. 10. (Chart No. 10)

Mary Ann Brown or Hunter, admitted to R.E.A. 7th April¹⁹⁰⁰ at age of 29. A case of Dementia with motor symptoms of General Paralysis which had not cleared up under anti-syphilitic treatment.

Staggering gait and marked defect of equilibration, articulation so blurred as to be scarcely intelligible, fascicular twitchings in facial and lingual muscles, irregularity and sluggishness of pupils and an exaggeration of the knee jerks were all the symptoms presented about 4 years ago by patient. She had steadily progressed into the third stage of the disease and 12 months ago became completely bed-ridden and emaciated with marked paresis of all the limbs, being unable to feed herself or attend to the calls of nature.

In July 1906 two separate hypodermic injections of toxins of a diphtheroid bacillus from which Serum No. 2 had been prepared, produced no effect on temperature or pulse or mental condition.

24th Sept. At 12.30 50 milligrammes of dead Bacillus No. I was injected into right arm. T. rose from 97.6° to 99.2° in 10½ hours, after falling to 97.8° in 8 hours, swung back to 99.2° in another 8 hours to fall rapidly to 97.2°. P. 80-90. Patient was very noisy all night shouting and singing

and violent in conduct. Although not able to get out of bed pitched a syphon of soda water at nurse. Impulsively destructive.

26th Sept. Slept well last night and showed no further excitement.

29th Sept. At 3 p.m. 50 m.g. of same dead bacilli were injected into left arm. T. rose, after falling 3 points, from 97° to 100.6° in 24 hours, dropping to normal 8 hours later.

Patient appeared to be suffering from severe headache.

4th & 5th Oct. Menstruated.

7th Oct. T. 100° at 6 p.m. and 10 p.m.

There was a very foul leucorrhoeal condition and diarrhoea which continued up to 13th.

Patient's state critical on account of extreme exhaustion. She however continued to live and from

13th Oct. to 27th Dec. (11 weeks) the temperature remained practically below the normal line.

Examination of the chart will show that during the next 14 days the temperature was irregularly raised above normal. It is interesting to observe that the charge nurse was from home and that the usual toilet with lysol swabbing and boroglyceride plugging for patient's leucorrhoea had been neglected.

29th January 1907. Sharp attack of diarrhoea accompanied with rise of temperature to 101.6° .

7th Feb. Decided to test patient's reaction to immunized-Sheep Serum. She was accordingly injected with 20 c.c. of B1 S1 S4 (5 & 2 days old) at 11 a.m. T. rose from 97° to 99.4° in 11 hours, dropped to 98.2° within 8 hours and rose again to 99° in a further 8 hours to fall to normal 4 hours later. P. 86-94.

15th & 16th Feb. Slight urticaria on arms and trunk and maintenance of temperature above 99° . Patient was noisy and restless at intervals.

18th Feb. 20 c.c. of B1 S3 (14 days) by mouth at 10 a.m. T. rose steadily to 100° in 8 hours and declined to normal within the next 12 hours. P. nil.

22nd Feb. Patient restless and noisy.

25th Feb. 20 c.c. of B1 S2 S4 (9 & 20 days) by mouth at 12 noon. T. ran up steadily to 100° within 6 hours to decline to 98° 12 hours later, rose again to 100° after 8 hours, slowly declining to 98° at the end of 24 hours more. P. 88-98.

Profuse perspiration, extreme pallor and increased muscular debility noted shortly after administration of the serum.

28th Feb. 20 c.c. of B1 S1 (8 days) injected at 4 p.m. T. rose to 99° in 2 hours, to 99.4° in 6 hours and reached 101° in 22 hours from injection, sinking to 98.2° 16 hours later. P. 90-94.

11th March. 20 c.c. of B1 S2 (5 days) by mouth at 10 a.m. T. rose to 99.2° in 4 hours, remained there for other 4 hours and dropped to 97.6° 12 hours after administration. P. nil.

13th March. Patient got up for 4 hours.

14-19th March. Menstruation - profuse.

18th March. 20 c.c. of B2 S5 (6 days) injected at 10 a.m. T. in 6 hours was 101° , dropping to normal 8 hours after, steadily rose again to 102° 16 hours later, fell to normal after other 8 hours and again declined to normal with oscillations from 100.4° 3 days later. P. nil.

It is to be noted that this reaction is the highest yet recorded in this case and yet there was no response to the injection of toxins of *Bacillus* in July 1906.

25th March. 20 c.c. of B1 S2 (5 days) injected at 10 a.m. T. rose from normal to 100.6° in 8 hours and returned gradually to normal 12 hours later. P. 80-90. There was profuse perspiration.

26th March. Patient was able to be up and outside in garden for 6 hours.

1st April. She is now able to feed herself and has developed control of bladder and bowels.

C A S E NO. 11. (Chart No. 11)

Ann McGill Irvine, aet. 45. Married.

Admitted to R.E.A. on 7th March 1906.

No history obtained except that she was addicted to alcohol.

Was sent from the Royal Infirmary certified to be "wandering in mind and noisy. Unable to answer questions intelligently. Delusions that she is being poisoned by the nurses. Passes everything in bed."

On admission. She was confused, dejected and emotional. Betrayed a considerable ^{degree} of facility in the peculiar interest she took in the other patients, and in making lengthy reports about them and chiding them for their behaviour. Among many other delusions, she asserted that she was "maltreated and subjected to experiments by young men in the Infirmary and in the office in which she worked."

She exhibited the following motor signs of General Paralysis :- Fine tremor in face and tongue: irregular, unequal and sluggish pupils: some defect of articulation: exaggeration of the knee jerks: unsteadiness of gait and tendency to sway to the right.

She suffered from slight chronic Bronchitis and mitral stenosis and had a marked degree of leucorrhoea.

Patient was previously under my care in 1902 when, except for vivid hallucinations of the special senses and suicidal impulses (the result of alcoholic poisoning), she exhibited the symptoms above detailed and was diagnosed as a case of non-progressive General Paralysis.

5th April 1906. Patient had a slight congestive attack to-day and was convulsed on left side for about 10 minutes.

11th April. Had a similar seizure to-day - the temperature running up to 100.2°.

16th April. Patient now up, but is very weak and unsteady on her legs.

20th Sept. Noted mentally, to be simple, morbidly amiable and childish. Subject to slight congestive seizures, during which she becomes pale, livid and expressionless, then "champs" her lips and tongue, loses consciousness and would fall if not supported. The arms, legs or face, together or separately, in the different seizures, exhibit clonic spasm for a few minutes and for the rest of the attack, which may last 3 or 4 days, patient lies in bed with a flushed and congested face; complains of intense headache, malaise and torpor. The tremors in face and tongue become more pronounced, the speech is more defective and there is profound and general muscular weakness. The temperature is raised,

usually above 100°. She may at other times have very slight seizures and continue to go about, while the temperature may be raised to 99° or so.

In March 1907 I decided to test this patient's reaction to the serum and accordingly a 4 hourly record of temperature and pulse was begun.

7th March. Patient had two slight "congestive seizures" (epileptiform) with the temperature at 99° at 6 p.m.

11th March. 20 c.c. of B1 S3 (12 days) given by mouth at 10 a.m. Temperature rose from 97° to 98.4° in 4 hours, to 98.6° in other 4 hours and after a fall to 97°, gradually ascended again to 98.8° 28 hours later, once more falling to 97° it rose in a further period of 24 hours to 98.6°, to fall finally below the 98° line in other 4 hours. P. 86-96.

Shortly after taking the serum patient complained of "dizziness and hunger" and exhibited marked drowsiness. During the following day she continued drowsy, was markedly flushed and cyanosed ("congested") in the face. There was also a distinct increase in her breathlessness (to which as the subject of Bronchitis she is liable), and she had frequently to sit and rest herself.

14th March. Slight epistaxis.

17th March. 20 c.c. of B1 S4 injected at 10 a.m.

T. only rose to 98.4° at 2 p.m. and it was not until after a fall to 97° 20 hours later that it rose to 99° 32 hours after injection. P. nil.

Drowsiness recurred, and patient experienced "tingling" sensations in her limbs and there was a marked polyuria; over 120 ounces of urine being passed during the night. Menstruation also returned, having been absent for 3 months.

25th March. 20 c.c. of B1 S3 (10 days) injected at 10 a.m. T. rose from 97° to 98.6° in 8 hours, ascended to 100.4° in other 8 hours, falling gradually to 99° 16 hours later and rose again to 100.6° in other 4 hours. For a further 8 hours it remained at 100° , fell to 98° 4 hours later and gradually mounted once more to 100.6° to fall finally to 98.2° 96 hours after injection. P. nil.

Patient looked inebriated and was hilariously excited after injection and experienced "burning" sensations all over her body.

On the following day she complained of a feeling of suffocation for a few moments and then experienced a sense of "relief in her chest" such as her bronchitic condition had never before permitted.

There was slight redness and swelling around point of injection for 1 day.

26th & 28th March. Patient had well marked universal urticaris which disappeared on the 30th.

1st April. 20 c.c. of B1 S4 (5 days) injected at 10 a.m. T. rose from 98.2° to 100° in 8 hours, remained at 100° for other 4 hours, fell gradually to 98° in 12 hours, rose again to 99.6° in other 8 hours, to fall finally below normal 40 hours after injection. P. 80-90.

4th April. Patient experienced "tinglings" and asserted "that she felt as if all the poison had been taken out of her body by the treatment."

8th April. 20 c.c. of B1 S3 (9 days) by mouth at 11 a.m. T. rose gradually from 98° to 99.4° in 31 hours, fell to 97.4° in 4 hours and with gradual rise to 99° , fell to normal 45 hours after exhibition of the serum. P. 90-100.

On this occasion patient only experienced a slight headache.

Georgy Minie Clark, æt. 48 (?) Tailoress.

Admitted to R.E.A. on 16th January 1905.

No history could be obtained in this case.

On admission. She was exalted in expression, having a fatuous beam: morbidly self complacent in manner and had innumerable grandiose delusions: talked in a pompous tone, but incoherently, about visiting the North Pole every night and demanded respectful attention and homage from all, as she was "Queen Majesty of the Globe."

Complete amnesia and disorientation.

She was well nourished but flabby: displayed very marked fascicular twitchings in labial and lingual muscles. The voice had an unsteady plaintive whine during ordinary speech and a marked stumbling, hesitating and muffled delivery was apparent when she tried to repeat test sentences. The knee-jerks were exaggerated and the gait tended to be swaying and unsteady. She suffered from a slight degree of chronic Bronchitis. Since admission over 2 years ago her disease has not progressed in the slightest degree.

On the 18th of February I decided to test her with serum as cases of non-progressive General Paralysis theoretically have established an active immunity, and should be but slightly, if at all, responsive to a serum test.

20th Feb 1907. 20 c.c. of B1 S2 (4 days old) injected at 10 a.m. T. rose to 99° in 8 hours, fell below normal within other 4 hours, and 24 hours later had a sharp rebound to 99.8° , falling finally to normal after other 8 hours. P. 86-90.

Patient felt "shivering with cold" shortly after injection.

25th Feb. 20 c.c. of B1 S1 (5 days) injected at noon. T. rose to 98.8° in 6 hours, dropped to 98.2° 4 hours later, to rise to 98.6° for next 8 hours and after a fall to 98° rose 12 hours later to 99.8° and to 100° at 2 a.m. on the second morning after injection, falling eventually below normal at 2 p.m. or 50 hours after the serum had been injected. P. 86-90.

Patient felt "smarting pains in her legs", and on the 26th said she felt "sore all over."

2nd March. 20 c.c. of B1 S4 (7 days) by mouth at 10 a.m. After an unusual swinging of temperature every 4 hours between 96.4° and 98.4° there was a rise above normal when 60 hours had elapsed to 99.6° . P. nil.

There was diarrhoea shortly after (half an hour) the taking of the serum: patient complained of intense hunger, the skin became cold and perspiration on limbs was exceedingly copious.

5th March. Gait was more than usually unsteady and patient lent and lurched to the right side.

11th March. $7\frac{1}{2}$ c.c. of B2 S6 (6 days) by mouth at 10 a.m. T. rose from 97.6° to 98.4° , to return to 97.6° in 12 hours. P. nil.

Patient said she "felt as if she had taken a glass or two of whisky" and exhibited the same cold perspiration as before.

18th March. 20 c.c. of B1 S1 (9 days) by mouth at 9.30 a.m. T. only rose a degree under the normal line. P. nil.

Patient again perspired very freely, felt "a wave of heat" and then had a cold perspiration and a brisk attack of diarrhoea.

25th March. 5 c.c. of B1 S3 (10 days) by mouth at 9 a.m. T. rose from 96.4° to 98° only in 8 hours. P. nil.

C A S E NO. 13. (Chart No. 13.)

Janet Sutherland, aet. 46. Married.

Admitted to R.E.A. on 4th Nov. 1904.

Disposition. Quiet and reserved.

Habits. Temperate and very industrious.

She has been subject to severe headaches for some years past and taken great quantities of medicine. About 14 months ago she became peculiar in behaviour, imagined "people made a fool of her in church and that prostitutes were following her."

Was sleepless and had severe headaches, loss of appetite with indigestion at times. Became irritable and threatened violence to step-son with a knife, and had to be sent to the Asylum.

On admission. She appeared fatuous and facile: had many delusions of persecution: exhibited great confusion of mind and impairment of memory.

Articulation was distinctly slurred and mumbling in character, and during excitement was "shivery" and stumbling. The gait was sloven and unsteady.

The skin reflexes were absent but the knee-jerks were exaggerated. The left pupil larger than the right and fixed consensually, while both were very irregular and sluggish to light and accommodation.

Since admission she has become progressively more demented and facile - smiles in an inane fashion -

unable to sustain the slightest conversation - and is occasionally irritable and threatens violence. The disagreeable hallucinations of hearing and sight have largely faded away. She is unable to occupy herself.

Had a "Diphtheroid leucorrhoea" which has been kept well in check by local swabbing periodically with boroglyceride.

In June last she was tested with toxins of Bacillus No. I, temperature rising to 99.2° after 25 m.g. of dead bacilli had been injected. Two similar subsequent injections within 9 & 15 days effected rises to 98.6° and 98.4° only, but produced a well-marked degree of mental excitement. For the next 9 months patient's temperature (of which a daily record had been kept) was almost constantly subnormal with very occasional rises above the 98° line.

In March I decided to test her serum reaction as a non-progressive case, so a 4 hourly chart was begun. For the first 6 days the temperature was very irregular but only once was as high as 98.8° .

18th March 1907. 20 c.c. of B1 S4 (5 days) injected at 10 a.m. T. rose steadily from 97.8° to 99.4° in 8 hours to fall below 98° 4 hours later. Slight rise next day to 98.8° . P. 80-90.

25th March. 20 c.c. of B1 S2 (5 days) injected at 10 a.m. T. rose from 98° to 99.2° in 12 hours, dropping below 98° 4 hours later. P. 86-90.

1st April. 20 c.c. of B1 S4 (5 days) injected at 10 a.m. T. rose from 97.4° to 99.2° and 6 p.m. and 10 p.m., to fall to 98° 16 hours after injection. P. 80-86.

8th April. 20 c.c. of B2 S5 (17 days) injected at 10.30 a.m. T. rose from 97° to 98.8° in 8 hours, falling towards normal in 12 hours. P. 78-96.
Patient complained of nausea and was unable to take dinner.

C A S E NO. 14. (Chart NO. 14)

Margaret Whitehead aet 52. Single. Domestic Servant.

Admitted from House of Refuge to R.E.A. 4th July 1904.

No history obtained.

Sent to Asylum under the following certificate :-

"Loss of memory: does not remember the month or year

"or whether it is summer or winter: wanders about

"the ward day and night in an aimless manner: speaks

"and behaves in an imbecile way."

On admission. Exhibited great confusion of mind:

very slow in responding to questions and appeared to have the greatest difficulty in realising her whereabouts or in expressing herself. She was facile and childish in appearance and demeanour.

She exhibited the following signs of General

Paralysis :- Sloven and unsteady gait: fine tremor in tongue and lips: mumbling and shaky articulation which was scarcely intelligible. The movements of the eyes were asynchronous and inco-ordinate, and both pupils were irregular, having a sluggish and limited range of movement

She had chronic Bronchitis.

There were circular satiny and brown-pigmented scars on shins (syphilitic).

Five days after admission patient took a "congestive seizure" during which the temperature was 99.6°. She had marked flushing & slight cyanosis of face, and had retention of urine: tongue feverish: marked coarse twitchings at angle of mouth: very marked torpor and headache.

12th August. Still dull, stupid, confused, incoherent and facile: very shaky in speech and gait.

20th Sept. Patient has passed into a state of remission at present and it would be difficult to say that she was a G.P.

21st Jan. 1905. Still in a state of remission. Mentally she is rather facile. There is distinct irregularity and sluggishness of pupils and labial tremor. Speech stumbling and indistinct at times.

In March 1905 she was in bed for a week with a "congestive attack". Was comatose for the first day, "congested" in the face and had marked facial twitchings while the temperature was 101.8°.

Vomiting on the 1st and severe headache on the 4th March. Pulse 108, subsided with temperature on 6th day to 78 per minute.

Jan. 1907. Her condition has not progressed much during the past 2 years. Mentally, she has more intellect and memory than during the first 6 months

residence. There are occasional slight congestive attacks and she at times drops plates or whatever she may be carrying, in a "nerveless" fashion. A 4 hourly chart was begun on the 12th March. It will be seen that the temperature and pulse were irregular, suggesting some toxic absorption. On examination it was found that she had a distinct foul-smelling leucorrhoea.

18th March. 20 c.c. of B1 S4 (5 days old) injected at 10 a.m. T. rose to 98.8° in 2 hours to fall below normal 8 hours after, rising again to 99° 24 hours after injection and fell to 98° 40 hours later. P. 80-90.

25th March. 20 c.c. of B1 S3 (10 days) injected at 10 a.m. T. only rose to normal, but was maintained thereabout, and 28 hours later was at 98.6° . P. nil.

1st April. 20 c.c. of B1 S4 (30 days) injected at 10 a.m. T. rose steadily to 99° in 12 hours and in 28 hours reached 99.6° to fall below normal 8 hours later. P. 80-86.

6th April. Patient complained of "rheumatic pains" all over her body.

8th April. 20 c.c. of B2 S5 (4 days) injected at 10 a.m. T. rose to 100.6° in 8 hours to fall to normal 12 hours later. P. 86-96.

Shortly after injection patient said she felt

"roasting" and there was profuse perspiration.

Next day she felt as if she "had been mangled."

10th April. Complained greatly of pains in back and legs and the temperature began again to oscillate to 100° and on the 12th her face was flushed and cyanosed. She was exceedingly drowsy and exhibited marked twitchings in the face: she perspired very freely: Temperature reached 100.6° at 6 p.m. to fall rapidly to normal at 6 a.m. next morning, when there was a copious foul smelling muco-purulent discharge from the vagina. Temperature again rose at 10 p.m. on the 14th to 101.4° and the leucorrhoeal material reappeared as copiously as the previous day in spite of lysol douching and boroglyceride plugging.

22nd April. Patient is up and going about much as usual and has a clear and fresh complexion which is in great contrast to the drowsy and dull one of a week ago.

C O N T R O L N O . I . (Chart Control No. I)

Margaret Brown, aet. 17. Single. Domestic servant.

Admitted to R.E.A. on 7th January 1906.

Disposition. Cheery and sociable.

Habits. Temperate and regular.

Previous Bodily Health. Always weakly since 2 years old. "Bad eyes."

Heredity. Father died of Phthisis. Paternal uncle died in an asylum.

Patient was "clever enough but kept back on account of "congenital eye defect. Became hyper-religious some "months ago and last week became excited after hearing "the Boy Preacher" and gradually passed into a state "of acute mania."

On admission. She was wildly hilarious. Kept laughing, shouting and singing; was exceedingly restless and exhibited great confusion of mind with complete incoherence of speech. Very thin and anaemic. Tongue thickly furred and lips covered with sordes. She exhibited "Conical cornea" and right external Strabismus. The pupils dilated, irregular and sluggish. All reflexes markedly exaggerated. For over 8 months patient continued in a daily alternating state of restless mania and anergic stupor. In June she was confined to bed with pyrexia for which

no cause could be discovered.

As patient was obviously passing into Secondary Dementia she was selected as a case to compare experimentally with cases suffering undoubtedly from General Paralysis, and on 20th Sept. a 4 hourly chart was begun. The temperature for 4 days was never higher than 97.6° .

At 12.30 p.m. on the 24th Sept. she was injected with a Salt Solution containing 50 milligrammes of Bacillus No. I, killed by heating for 10 minutes at 60°C . T. 97.2° at 10 a.m., was 97.6° at 2 p.m. and fell to 96° at 6 p.m. to rise steadily to 99.8° by 10 a.m. next day ($21\frac{1}{2}$ hours), falling again to 97° 20 hours later. Pulse increased from 80 to 116.

There was intense erythema and considerable oedema of skin of the whole of the right upper arm which had been injected; this subsided on the 27th after the application of a Picric Acid compress.

It was decided to subject the patient to the serum test and on the-

6th Oct. Only 2 c.c. of B1 S1 were given by mouth at 10.30 a.m. T. went from 96.6° to 97.6° and then dropped to 95° . Next day it was normal at 10 a.m. and 2 p.m. Pulse increasing 90-106.

10th Oct. $2\frac{1}{2}$ c.c. of B1 S2 by mouth at 9.30 a.m.

T. did not rise above 97° . P. nil.

11th Oct. 2½ c.c. of B1 S1 by mouth at 6 p.m.

T. continued below 96.4° all next day. P. nil.

17th Oct. 1½ c.c. of B1 S1 by mouth at 10 a.m.

T. continued below 97° for next 3 days. P. nil.

20th Oct. 2½ c.c. of B1 S3 injected at 11 a.m.

T. which was 96.4° at 2 p.m. rose straight up to normal at 6 p.m. and fell steadily from 98° at 10 p.m. to below 97° next day. P. 88-90.

23rd Oct. 5 c.c. of B1 S3 S4 at 2 p.m. by mouth only effected a rise from 96.6° to 97.2° (4 points) by 10 p.m. P. nil.

24th Oct. 15 c.c. of B1 S1 S3 injected at 10 a.m. resulted in a rise from 96.2° to 97.8° at end of 20 hours. P. nil.

30th Oct. 15 c.c. of B1 S1 S3 injected at 10 p.m.

T. rose only from 97° to 98.2° in 8 hours, to subside below 97° after very short swings 24 hours later.

P. 72-102.(?)

Patient very resistive and struggling violently when nurse was taking temperature and pulse.

6th Nov. 15 c.c. of B1 S1 S3 injected at 11 a.m.

T. rose from 96.8° to 97.2° at the end of 19 hours.

P. 90-102.

Patient constipated.

11th Nov. 20 c.c. of B1 S3 S4 injected at 12 noon.

T. fell 4 points from 97.4° in 4 hours and never reached beyond 97.4° during the next 3 days. P. nil.

15th Nov. 10 c.c. of B1 S1 S3 by mouth at noon.

T. was 1.2° higher ($97-98.2^{\circ}$) at the end of 42 hours and oscillated between 97° and 98° for 4 days afterwards. Pulse rate decreased.

22nd Nov. The patient removed to another asylum, "not improved" being rather more demented.

The temperature was never raised above the normal line by Serum No. I in doses varying from $1\frac{1}{2}$ c.c. to 20 c.c. by mouth or by injection: the latter chiefly in doses of 15 c.c.

Pulse was also unaffected. The increase on 3 occasions was out of all proportion to what might have been caused by the Serum and is really accounted for by ~~other~~ by other factors, viz., maniacal excitement, irritability of heart, resistiveness and constipation.

C O N T R O L N O . 2 (Chart Control No. 2)

Annie Meikle, aet. 19. Single. Rubber-worker.

Admitted to R.E.A. on 9th Oct. 1906.

Disposition. Quiet: reserved.

Habits. Correct.

Previous Bodily Illnesses. Scarlet fever in infancy.

Heredity. Paternal uncle died in asylum. Maternal aunt an inebriate.

Patient during the past 3 years was apt to be odd at times and fellow-workers made a fool of her. Was sleepless, restless and suffered from headaches and lassitude in the Spring.

Menstruation very irregular.

A fortnight ago she complained of being "mesmerised" and had delusions her father was put out of work and that he was in trouble.

On admission. She was in a state of acute Excited Melancholia, being intensely fearful and suspicious, exceedingly restless and agitated, excessively resistive and utterly bewildered.

There were no motor symptoms of General Paralysis present.

Towards the end of November she passed into a maniacal state, becoming hilarious, cheeky, mischievous and erotic, chattering continually for days and nights at a stretch.

She was selected for control and a 4 hourly record of temperature and pulse begun.

5th Dec. 20 c.c. of B1 S1 by mouth at 12 noon.

T. from 97.8° dropped to 96° in 8 hours and during next day remained below 97.2° . Pulse, no increase in rate.

7th Dec. 20 c.c. of B1 S2 injected at 2.30 p.m.

T. sank to 96.4° by 10 p.m. P. no change.

8th Dec. 15 c.c. of B1 S3 by mouth at 12.30 p.m.

T. 96.4° at 2 p.m. rose to 98° at 6 p.m., and remained there for next 12 hours and at 10 a.m. next day actually reached 98.6° to drop shortly to 96.8° to remain below normal line for next 4 days. P. 86-90.

14th Dec. 20 c.c. of B1 S4 injected at 11 a.m. T. dropped from 97.8° to 97° and except for being 98° at 10 a.m. and 6 p.m. next day, remained below the 97° line for the 5 days following.

19th Dec. Patient very noisy and excited.

20th Dec. Patient chattered and sang all night.

T. to-day mostly about 98° line and pulse rate at 10 p.m. as high as 96.

21st Dec. 20 c.c. of B1 S1 injected at 11 a.m.

T. remained all day below 97.6° but gradually ascended to the normal line by 6 p.m. next day (31 hours.)

Patient had continued noisy and restless all night.

P. 86-96.

26th Dec. For past 3 nights some sleep could only be induced by use of Sulphonal.

29th Dec. T. 99° at 10 p.m.

Next day patient menstruated for the first time since admission.

5th Jan. 1907. 15 c.c. of B1 S1 S4 injected at 11 a.m. T. only rose 6 points, to 98°.

13th Jan. 20 c.c. of B1 S2 (4 days old) injected at 10 a.m. T. rose 2 points in 3 hours to fall to 96.8° within the next 4 hours. P. 80-96.

Slight redness and swelling at point of injection noticed in evening and at this time pulse was 96.

18th Jan. 20 c.c. of B1 S1 (4 days) injected at 11 a.m. T. fell from 97.6° to 97° and continued below the 98° line for the next 14 days. P. nil.

5th, 6th & 7th Feb. Patient menstruated for the second time.

7th Feb. 20 c.c. of B2 S6 (2 days) injected at 11 a.m. T. rose to 97.8° 8 hours after and was 98° the following day: it however had been mostly at this line the day before injection.

9th Feb. At 2 p.m. and 10th at 10 a.m. T. reached normal line.

20th Feb. 20 c.c. of B1 S3 injected at noon. T. which had been 97.6° at 10 a.m. dropped to 96.4° at 2 p.m. and never got above 97.6° during the next day.

22nd Feb. Patient removed to another asylum.

In this case the serum only caused ^arise to 98.6° ;and this on one occasion;and this only after 55 c.c. had been given in a period of 72 hours.* It is conceivable that any foreign serum injected into the human subject in this quantity would cause some temperature reaction.

The highest increase in pulse rate only occurred when local reaction was present and on the other occasion she had been passing through a phase of acute mental excitement.

It is interesting to note that she often was doing hard work in the kitchen on the days of injection. The only result of the serum was the onset of menstruation.

* Since writing the above an extract from an article by Bienenfeld of Vienna appears in the Medical Press for April 24th, where it is stated that "the injection of 130 c.c. of serum was followed by urticaria, articular swelling, albuminuria and elevation of temperature."

C O N T R O L NO. 3. (Chart, control No. 3)

Mrs. Lr--C.--- aet 34. Married. Lady.

Admitted to Craig House 30th June 1906.

Disposition. Cheerful: reserved.

Habits. Correct.

Heredity. Father committed suicide.

"Patient became melancholic
"after birth of her only child (still-born) 3½ years
"ago. She suffered from marked depression of mind,
"with hallucinations of hearing and confused ideas
"of mesmeric influences. She got well for a time
"but relapsed into a state of excited melancholia.
"Was 'tearful' rigid, resistive, and maintained a
"'hunched up' attitude; and there was marked
"inhibition of speech.

"Thyroidin treatment in August 1904 and February 1905
"only affected temporary benefit."

She has now lapsed into Dementia, is unoccupied,
apathetic and asocial; is apt to be resistive and
has periods of tearful emotionalism and agitation
during which there are very marked tremors of face
and a "shivering" and mumbling articulation closely
simulating that of General Paralysis.

On the 7th February 1907, Dr. Clouston asked
me to test this case with serum and a 4 hourly

record of the patient's temperature and pulse was begun.

16th Feb. 1907. 20 c.c. of B1 S4 (10 days old) were injected at 10 a.m. During the next 8 hours the temperature dropped a degree from 98.6° where it was before injection, regained the normal line 4 hours later. The pulse became slower for the next 3 days and instead of varying from 76-112 as previously, it showed only a range of 78-96 beats after injection.

23rd & 24th Feb. An urticarial rash appeared all over the patient's body and limbs, and the temperature on the latter day reached 99° .

28th Feb. 20 c.c. of B1 S1 (8 days) by mouth at 10 a.m. T. rose 4 points in 8 hours (97.6° to 98°) and at 6 p.m. on the following day was 98.20° .

The pulse rate again showed a tendency to slow down from over 100 to a steady average of 80 beats per minute.

18th March. 20 c.c. of B2 S5 (6 days) injected at 11.30 a.m. T. remained between the 97° and 98° lines, and only exceeded this limit on the following day at 10 p.m. when it touched 98.4° . No apparent increase of pulse rate occurred.

This case has shown no reaction to either Serum No. 1 or No. 2. Before injection I was of opinion that her condition was not one of General Paralysis and Dr. Clouston was satisfied with my finding.

C O N T R O L N O . 4 . (Chart, control No. 4)

Elizabeth Chisholm, aet. 26. Nurse. Single.

No history to hand, except that her mother is alcoholic.

Admitted to R.E.A. on 2nd February 1907.

Certified as being :- "Restless, excited, having "delusion that she was transported to hell, that she "is dead, and is being smothered - threatened suicide."

On admission. She laboured under Excited Melancholia with delusions of persecution. Skin hyperaesthetic and knee-jerks exaggerated.

Tongue furred and bowels constipated.

She was emaciated and anaemic and in an exhausted state.

Temperature since admission only once above normal line and then only to 98.6°. She was selected as a suitable case for control and on-

21st March. was given by mouth 20 c.c. of B2 S5 and B1 S4 at 8.30 a.m. No reaction was apparent in temperature or pulse except a rise to 98.8° 3 days later.

25th March. 20 c.c. of B1 S2 injected at 10 a.m.

T. never rose above 98° during the ensuing 6 days and there was no obvious increase in the pulse rate.

1st April. 20 c.c. of B1 S1 (9 days injected at 10 a.m. T. did not rise above 98° except 2 days later,

while an urticarial rash developed, the temperature only went up to 98.2° . P. 90-96., but the latter number had often been registered without relation to administration of serum.

Patient was a little restless on the following day, wanting to get out of bed as she believed there were animals under the bed going to do her harm.

8th April. 20 c.c. of B2 S5 (6 days) injected at 10 a.m. T., which stood at 97.8° on injection, never rose above that point and pulse showed no increase as compared with previous days.

The rise of the temperature to 98.8° F. at 2 a.m. on the 3rd day after the serum was given is much more likely to be the result of excessive masturbation, which this patient practises during the night. It is a well known fact in asylums that the temperature is slightly raised from this cause. This view is supported in this case by the fact also that from the 22nd March to the 2nd April the temperature was always higher during the night and early morning than during the day. And again her evil practice has extended into the day-time and her temperature 7 days after serum stopped was 99° at 10 a.m.

C O N T R O L N O . 5 . (Chart, control No. 5)

Ida McGlashan, aet. 38. Single. Dressmaker.

Admitted to R.E.A. 20th February 1907.

Disposition. Very cheerful till she became epileptic.

Habits. Temperate.

Previous Bodily Illness. St. Vitus' Dance in childhood.

Heredity. Mother died of Rheumatic Fever. Four sisters were rheumatic and one of them took a "shock" (embolism ?) and died.

Patient developed epilepsy 17 years ago and she gradually became morose and irritable. The fits have recently become more frequent and the patient more sullen and still more irritable. She developed Acute Mania of a very violent type and for 24 hours prior to admission it "had been a continuous struggle" with several persons to restrain her. Her sister states that patient's menstruation is usually very copious and the discharge has an exceedingly foul odour.

On admission. Patient was in a state of the wildest epileptic furor; it required 4 nurses and 1 man to place her in the padded room. Mental obfuscation complete: no impression could be made on her consciousness. She merely emitted volleys of verbigeration

and filthy expletives .

Physically well nourished and muscular. She exhibited irregular choreiform and inco-ordinate movements of face and limbs, and marked facial tremor. Extraordinarily sensitive to touch on any part of her body. Pupils widely dilated and unequal. Patient gradually quietened down but always exhibited the tremors and choreiform jerkings of limbs and twisting movements of face. She had a marked tendency to grinding of teeth and automatic lip-smacking so often observed in cases of General Paralysis, but in her case associated with Hystero-Epilepsy.

As she was the subject of convulsions and presented a number of ^{other} motor signs of cerebral toxaemia, she was considered a suitable case for contrast in Serum-diagnosis.

18th March. 20 c.c. of B1 S4 (5 days old) injected at 10 a.m. The temperature rose to 98° from 96.20 but subsided to 97° in 4 hours and showed no tendency to rise beyond 98°. P. 82-86.

Within an hour of injection had a very severe fit lasting about 20 minutes and continued in the usual post-epileptic drowsiness all day.

19th March. Emotional and excited and expressed homicidal desires.

20th March. Very irritable.

21st March. 20 c.c. of B2 S5 (9 days) by mouth at 8 a.m. At 6 a.m. the temperature reached normal and patient was drowsy but there was no real disturbance of temperature or pulse except that the latter was a few beats less than prior to administration of serum.

23rd March. T. touched 98.6° at 6 p.m.

25th March. 20 c.c. of B1 S2 (5 days) injected at 10 a.m. T. only ascended as far as 98° in the next 16 hours to re-ascend next day from 96.4° to normal. Pulse showed no material increase in rate, while she had unusual and severe urticaria.

1st April. 20 c.c. of B1 S1 (9 days) were injected at 11 a.m. T. which was 97.6° at 10 a.m. attained a maximum of 98.2° 3 hours later and was mostly well below 97.6° for the next 3 days, till an accession of fits and the subsequent onset of profuse and offensive menstruation were accompanied by an oscillating pyrexia.

The very slight rise to 98.6° after 58 hours is not like the rise in General Paralysis and a similar rise at 2 p.m. occurred on 16th April without any relation to fits or administration of serum.

The unstable character of the temperature is well shown in the Menstrual Pyrexia which she exhibits towards the end of the chart.

The onset of fits was probably a mere coincidence.

C O N T R O L NO. 6 (Chart No. 6)

Elizabeth Turner or Main, aet. 65. Married.

Admitted to R.E.A. on the 7th February 1907.

She had all the mental characteristics and appearance of the alcoholic dement. The husband subsequently confessed that she had drunk heavily for over a year.

She had hyperaesthesia of calf muscles, very irregular pupils and unequal and rather sluggish in their reactions. Quite paraplegic and the knee-jerks abolished. Speech blurred and indistinct. Frail and tremulous. Tongue tremulous. Face mask-like.

Profuse leucorrhoea and chronic diarrhoea.

She has remained a bed-ridden alcoholic paralytic since admission. The temperature in daily chart has been very irregular all along but seldom above normal line.

She was selected as a contrast case and was put on a 4 hourly chart on the 21st March. Temperature was mostly between 97° and 98° , but on 4 occasions was above the normal line, during 4 days.

25th March. 20 c.c. of B1 S2 (5 days) injected at 10 a.m. Beyond a rise to 99.2° at 10 p.m. next day or 36 hours after injection and a difference in pulse rate of 90° to 96° , there was absolutely no

change in patient's mental or physical condition.

1st April. 20 c.c. of B1 S1 (9 days) injected at 10 a.m. T. which was 98° at 6 a.m. and 96.2° at 10 a.m., became 98.2° at 2 p.m., subsiding to 97.0° 16 hours later. P. no change.

8th April. 20 c.c. of B2 S5 (5 days) injected at 10 a.m. T. steadily fell from 98° to 96.4° in 4 hours, oscillated from 96° to 98.2° and on second day after injection was 98.8° at 10 a.m. No increase in pulse rate.

A glance at the temperature line as a whole will show that the administration of the serum can scarcely said to have altered its character. As the case is subject to profuse leucorrhoea and chronic diarrhoea (alcoholic), an irregular temperature, with occasional rises to 99° or so, might well be expected, and any such rise seen subsequent to injection might readily be mere coincidence.

An exactly similar case of alcoholic Dementia in a neighbouring bed exhibits a chart of the same character, and is not being subjected to the serum. Such cases, on the other hand, may have a degree of diphtheroid toxaemia, but *scarcely* owe their mental and physical deterioration to it.

A reaction is perhaps therefore what one ought to expect - and indeed the Italian authors according

to Tanzi assert that no case of Alcoholic Paralysis and Dementia in asylums can quite satisfactorily be distinguished from General Paralysis. I am strongly inclined to favour this ^{view} from my own observations.

C O N T R O L N O . 7 (Chart No 7)

Lilias Herd or Miller, aet. 61. Married.

Admitted to R.E.A. 6th July 1905.

No history.

Certified as being:- "Very depressed. Said people "shout up to her from the streets and that those "living above her put powder down through the floor "to injure her."

On admission. Facile and devoid of intelligence and unable to take an interest in anything. Can only give a very vague account of people tormenting her. An extraordinarily emaciated old woman, muscles generally being markedly atrophied. Knee jerks diminished and pupils sluggish but there was nothing further to suggest General Paralysis.

A 4 hourly record was begun on the 21st March 1907.

For 3 days before injection the temperature was never higher than 97.8°. Pulse varied from 70-86.

25th March. 20 c-c . of B1 S2 (5 days) injected at 10 a.m. T. rose from 97.4° to 97.6° only, in 4 hours, to drop to 96.2° steadily in 12 hours. P. nil.

1st April. 20 c.c. of B1 S1 (9 days) injected at 11 a.m. T. dropped from 97.6° to 96.8° in 4 hours but then rose steadily to 99.4° by 2 a.m. next morning, and after wavering about 99° reached 100° 55 hours after injection, to subside below normal 32 hours later. P. 80-80

This rise must be regarded as a fallacious result on account of a severe local reaction which took place, probably of the nature of slight sepsis. There was brawny induration at seat of injection and severe diffuse erythema and oedema of the whole of the skin of abdomen. This was accompanied by an intense universal urticaria which was very pronounced, even on the face.

8th April. 20 c.c. of B2 S5 (6 days) by mouth at 11 a.m. T. rose from 97.8° to 98.2° in 4 hours to fall steadily to 96.8° 16 hours later. P. 66-86.

15th April. 20 c.c. of B1 S2 (10 days) by mouth at 10 a.m. T. dropped from 97.6° to 97° and only rose to 97.8° at 6 a.m. next day. P. nil.

The unfortunate complication of local inflammation which caused the rise in temperature was entirely due to the fact that the patient was wet and dirty in her habits and kept constantly rubbing the site of injection. Otherwise no reaction can be said to have occurred as the result of injection of Serum No. 1 and the administration of No. 1 & No. 2 by the mouth.

C O N T R O L N O . 8 (Chart, Control No. 8)

Margaret Garget, aet. 40, a case of Dementia Paranoides (Kraepelin) admitted on 21st January 1907, having been boarded out in the country as a harmless lunatic since 1895.

On admission. She exhibited considerable enfeeblement of mind: an extraordinary degree of incoherence of speech: abeyance of memory and inability to attend to simple questions or express her wants, and was utterly devoid of rational initiative. Calls herself "No. 3" and the people around her by equally quaint misnomers.

She was in good bodily health and devoid of any motor symptoms which might suggest the existence of General Paralysis.

On 21st March a 4 hourly chart was begun. The temperature for 4 days varied from 96.2° to 98° but was never higher, while the pulse ranged from 70 to 86.

25th March. 20 c.c. of B1 S2 (5 days) injected at 10 a.m. T. dropped from 97.4° to 96.4°, regaining the 98° line next day. P. 78-70.

1st April. 20 c.c. of B1 S1 (9 days) injected at 11 a.m. T. dropped to 97° from 98° line but in rising got no further than 98.2° 11 hours after injection. P. nil.

8th April. 20 c.c. of B2 S5 (6 days) injected at 10 a.m. T. went from 97° to 97.4° but dropped to 96° at 10 p.m. P. nil.

15th April. 20 c.c. of B1 S2 (11 days) by mouth at 10 a.m. T. dropped from 97° to 96.4° and in another 4 hours rose only ^{to} 97.2°. P. nil.

This case showed no reaction in pulse or temperature. While neither mentally nor physically did she betray any evidence whatever of having been subjected to the Sera by injection on 4 different occasions.

CASES SUMMARISED.CASE NO. 3

		<u>Injection</u>	<u>Mouth</u>
Reactions of Serum No. I 20 c.c.	Smallest Temp.	98.8°	98.6°
	Greatest "	102.4°	99.8°
	Average "	100.2°	99°
	Shortest Time	3 Hours	4 Hours
	Longest "	22 "	20 "
	Average "	10.6 "	4.7 "
	Shortest Duration	12 "	4 "
	Longest "	53 "	44 "
	Average "	27.6 "	6.3
Average increase in Pulse rate		12.7	0

Injectations 1st & 2nd of 5 c.c. effected no rise of temperature but 3rd sent T. to 99°.

The 4th injection caused symptoms of threatening ["]congestive attack for 15 minutes.

Patient was prone to local reactions and is the only case in which suppuration occurred.

The reactions in March averaged only 98.6°. This suggests that the patient is not at present suffering much from the toxaemia. It cannot be because the serum is being given by the mouth as smaller doses earlier in the course of treatment produced a reaction.

Mentally, the patient has become quite lucid and is actively, intelligently and interestedly employed in house-work. Memory normal. Has quite lost the "G.P. facies." Gait and articulation unimpaired. Pupils equal and circular. Tremors in tongue and

absence of knee-jerks are the only traces of the disease at present remaining.

No "congestive seizure" which was "the feature" of her case, since 7th January and that only a slight threatening.

Is free from leucorrhoea and menstruating regularly.

CASE NO. 4		<u>Injection</u>		<u>Mouth</u>	
Reactions of Serum No. I 20 c.c.	Smallest Temp.	98.6°		98.8°	
	Greatest "	100.6°		100.2°	
	Average "	99.6°		99.5°	
	Shortest Time	2 Hours		1½ Hours	
	Longest "	69	"	28	"
	Average "	15.9	"	8.2	"
	Shortest Duration	23	"	8½	"
	Longest "	156	"	62	"
	Average "	43.6	"	32.5	
Average increase in Pulse rate		9.1		6.6	

Never any local reaction except vomiting after taking by mouth once.

Had no urticaria.

Reacted well to small doses from the beginning.

Mentally, instead of being "a confused, restless, amnesic, huddled-up, bed-ridden General Paralytic" she has now regained the powers of attention and memory. Is able to get up and go about: can employ herself knitting and reading and does a little house work. Goes to meet her relatives and converses quite rationally with them. Takes an intelligent interest in her surroundings. her expression of face has entirely changed from one of "sodden stupidity" to one of kindly and pleasant intelligence. The pupils have a greater range of movement. The speech is considerably clearer and crisper and her general muscular state is one

greatly improved tonicity. She has become stout and healthy complexioned. Her own family doctor and relatives are so impressed with her improvement that instead of insisting upon her removal home to die, as they were intending to do some months ago, they are now delighted to have her remain here indefinitely in the hope of her possible recovery.

The most marked improvement dates from the period of great mental excitement following injection of B1 S4 on 2nd March.

CASE NO. 5

		<u>Injection</u>	<u>Mouth.</u>
Reactions of Serum No. I 20 c.c.	Smallest Temp.	99°	100°
	Greatest "	103.4°	102.2°
	Average "	100.5°	101.4°
	Shortest Time	3 Hours	8 Hours
	Longest "	151 "	66 "
	Average "	27.8 "	37 "
	Shortest Duration	23 "	32 "
	Longest "	167 "	151 "
	Average "	68.6 "	93.6 "
Average increase in Pulse rate		11.5	12

Never any local reaction.

Reacted well even to 5 c.c. by mouth (100°).

It is a curious fact that she averaged a higher temperature reaction in mouth administration than by injection which suggests that the intestinal infection is severe. The prolonged effect is also a feature of her case.

The patient had been placed in the Asylum Hospital in an emaciated helplessly paralytic state with "contractures and bedsores"; presumably to die, having apparently passed into the final stage of the progressing disease.

The only obvious symptoms of General Paralysis now present are the fascicular tremors in tongue and the absent knee-jerks.

The pupillary anomalies have disappeared: the speech

and gait are but very slightly impaired, while the expression of face is ^{alert and} ~~almost~~ intelligent. She does a hard day's work, free from pains and ^{no} shows emotional disturbance: takes an active interest in all around her, and is possessed of a sound judgment in her family matters. Getting well nourished and fresh complexioned, and the very severe leucorrhoeal condition has quite abated meantime.

CASE NO. 6.

		<u>Injection.</u>	<u>Mouth.</u>
Reactions of Serum No. I 20 c.c.	Smallest Temp.	98.8°	99.4°
	Greatest "	103°	101.2°
	Average "	99.7°	100°
	Shortest Time	3 Hours	8 Hours
	Longest "	21½ "	36 "
	Average "	11 "	16.7 "
	Shortest Duration	14 "	16 "
	Longest "	44 "	64 "
	Average "	29.9 "	36.7 "
	Average increase in Pulse rate		8.3 3.5

Serum No. 2 produced similar reactions to Serum No. I.

It is interesting to note that patient's father had Tabes and mother would appear to have had General Paralysis.

Slight general improvement in mind and body.
 Able to feed herself: converses with relatives coherently and shows return of memory at times: takes an interest in her surroundings, knits a stocking and occasionally reads a book.

CASE NO. 7

Reactions of Serum No. I 20 c.c.		Injection	Mouth.
	Smallest Temp.	101°	98.6°
	Greatest "	103.6°	99.6°
	Average "	102.3°	99.1°
	Shortest Time	11 Hours	4 Hours
	Longest "	30.5 "	27 "
	Average "	20.7 "	12.2 "
	Shortest Duration	74½	8 "
	Longest "	75 "	108 "
	Average "	74½	34.9 "
Average increase in Pulse rate		20	6

Diarrhoea.

A single injection of 20 c.c. of Serum No. 2 resulted in a rise to 101.2° and increase of pulse by 24 beats.

No local reaction has occurred.

This patient reacts to both sera. At first the reaction was very great and at that time she had a marked leucorrhoea, which previously had been proved to be very largely due to the presence of a diphtheroid bacillus.

She reacts feebly ^{by} mouth as compared with injection, and when given in the former method diarrhoea would seem to have prevented proper reaction.

Mentally, there is slight improvement. She can reply in a childish way to simple questions: is able to do a little house work, but the motor signs remain much the same.

She looks like a case of considerable duration with irreparable organic brain damage.

CASE NO 8

All three injections of Serum No. I effected a rise of temperature averaging 99.4° within 11 hours at longest, the reaction lasting 10 and 43 hours in two instances and the average increase of pulse rate was 8.

The 3rd dose of the serum was given by the mouth and 99.6° was registered in 12 hours, the reaction lasting 28 hours.

The 2nd dose by mouth failed to raise the temperature as diarrhoea promptly followed its administration. A subsequent dose of 20 c.c. of Serum No. I and of Serum No. 2 failed to produce temperature reaction beyond 98.6° .

The motor symptoms which were present in January have now (31st March) disappeared except that the knee-jerks remain abolished.

She is quite free from intellectual impairment or emotional disturbance of any kind and repeatedly assures me that her present healthy state of mind and body dates absolutely from the commencement of the specific treatment.

CASE NO. 9

The two injections of Serum No. 1 caused a rise of temperature to 101° in the same time of 7 hours, and the reaction lasted 47 and 31 hours on each occasion, the Pulse increasing by 12 and 10 beats.

Three doses of 20 c.c. by mouth gave a temperature of 100.4° , 99.2° and 100° , all within 8 hours, with an average increase of pulse of 4 beats, the reaction lasting 32, 12 and 20 hours.

Serum No. 2 was given by mouth on 2 occasions: the temperature on both reached to 100° in 8 or $8\frac{1}{2}$ hours, with a pulse increase of 6 and 10 beats.

She had never any local effect.

She was prone to the same prolonged temperature oscillations which were to be seen in the other cases associated with severe leucorrhoea. (Cases No. 5, 6, & 14)

The reactions are strikingly constant; and for serum diagnosis this patient is an ideal case.

The mental condition has undergone an extraordinary improvement. She has lost the stupid anergic appearance, and she is alert enough to carry messages, do house and needle-work and join in general conversation. Her memory has quite returned.

The gait is greatly improved and the speech is much more distinct.

The leucorrhoea has considerably abated.

Such a case promises well for serum treatment.

CASE NO. 10.

In July there was no reaction to toxins of Bacillus No. 2, but a definite reaction in temperature and pulse and the production of acute mental excitement resulted from injection of 50 m.g. of dead bacilli No. 1

Serum No. 1 by injection on 3 occasions gave an average rise of 100.3° in average period of 13.6 hours, lasting on an average 29.6 hours, with an increase of pulse rate averaging 7.3

One injection of No. 2 produced a rise to 102° in 30 hours lasting 88 hours.

By the mouth Serum No. 1 was twice followed by a temperature of 100° and on a third occasion by 99.29° all within 8 hours and lasting on an average 27.3 hours, with an average increase in pulse rate of 3.3 beats.

She had never shown local reaction but the usual general effects were noted.

Mentally, she has improved to the extent of being able to feed herself and of being mindful of cleanliness in her attention to calls of nature.

Physically strong enough to walk unsupported into the garden where she can sit for hours.

This improvement has taken place in a 3rd stage, bed-ridden, exhausted and emaciated General Paralytic.

CASE NO. 11.

20 c.c. of Serum No. I by injection on 3 occasions produced temperatures from 99° , 100° and 100.6° all within 36 hours: the reaction lasting on an average 57.3 hours: there was an average increase in pulse of 3.3 beats.

By the mouth on 2 occasions the serum caused a rise of temperature to 98.8° and 99.4° within 32 and 31 hours, lasting 64 and 45 hours, with an increase of pulse by 10 beats after each dose of 20 c.c.

Her memory has become quite good: she is now active and alert: marked irritability has become marked amiability.

The speech defect is scarcely apparent, even with test sentences and her gait is unaffected.

Physically she is now robust, and mentally so improved that she has developed an unwonted stability and is now engaged in instructing nurses and patients in dressmaking.

Prior to serum treatment she was quite incapable of this.

This case is of considerable interest with regard to the bronchial condition, as she experienced definite pulmonary phenomena which suggest a local effect of the bactericidal serum, c.f. the cases with leucorrhoea & diarrhoea.

CASE NO. 12.

Two injections of 20 c.c. of Serum No. I produced rises of 99.8° and 100° in 37 hours with mean duration of 47 hours.

By the mouth, on 3 occasions, temperature went to 99.6° only with the first dose and after 6 hours had elapsed.

Reaction occurring in this case goes to show that, though theoretically the disease is non-progressive because an active immunity has been established, there is still an infective focus with toxæmia persisting in the patient's system.

Diarrhoea here again seems to delay, if not destroy the effect of the serum. A rise did occur after the diarrhoea had ceased as in other cases.

"Smarting pains in legs" and the temporary return of ataxic symptoms after injection on the 25th Feb. and 2nd March respectively are suggestive and interesting.

Improvement is to be observed in the patient having a more contented frame of mind, less confusion and a voluntary inhibition from expressing grandiose ideas and delusions.

CASE NO. 13.

Three injections of 20 c.c. of Serum No. 1 had similar reactions averaging, within 2 points, a temperature of 99.3° , twice within 8 hours and twice lasting only 16 hours with an average increase of pulse of 7 beats.

One injection of Serum No. 2, produced a temperature of 98.8 in 8 hours lasting 12^{hours}, with a pulse increase of 18.

No local reactions.

This case like the others also reacted but being almost free from leucorrhoea, one would scarcely expect as high a temperature result as one meets in acute and progressive cases.

CASE NO. 14.

Three injections of Serum I produced rise of temperature to 99° , 98.6° , 99.6° averaging 99° in 24 to 28 hours, lasting from 28 to 36 hours, with 5 beats average increase in pulse.

Serum No. 2 was injected and produced a profound effect; temperature rose to 100.6° in 8 hours to last for 20 hours, and again for the following 8 days a marked pyrexia with an exacerbation of very foul leucorrhoea supervened (c.f. Cases No. 5, 6, and 9) and she had the symptoms commonly associated with a "congestive attack."

Although responsive to Serum No. I it would appear that the diphtheroid infection^{*} to which this patient is subject is of the type of Bacillus No. 2.

An attempt to isolate the organism on 7th April failed, the tube remaining sterile.

* The bacillus was cultured from vagina during a previous portion of the research, but it has not been tested by Gordon's method.

Though unable to show a detailed record, I should like, in support of this thesis, to mention a few cases which were under treatment outside this asylum.

A gentleman in the 2nd stage of General Paralysis was given 11 injections of Serum No. I by me at the request of Dr. Ford Robertson.

The patient was intensely confused in mind and had a paretic and ataxic gait, and was frequently having short congestive seizures. The temperature always rose above 99° after injection and on 4 occasions was above 100° . The reactions became steadily less as he improved in mind and body, and he was able to go home and resume some of his business duties.

In a case which Dr. A.N. Fell recently asked me to see in consultation, I was able to confirm his diagnosis of General Paralysis by means of the temperature reactions to Serum No. I, of 99° and 100° F.

A young gentleman with General Paralysis in the care of Dr. Cole, Uxbridge, has shown distinct temperature reactions after each dose, some of which records by the mouth were sent to me as follows:-

March 14th	Serum No. 1	by mouth	T. 100.2°
" 16th	" No. 2	"	100°
22nd	" ?	"	100°
" 28th	" No. 2	"	101.2°

and I quote the following from Dr. Cole's letter giving the results of Serum treatment.

"Mr. C. came here on Aug. 31st in a state of very acute mania with signs of G.P. of which there is no doubt. After being very destructive and noisy he settled down into a weak-minded, laughing state and since the serum injections has markedly improved. I did not think he would have a natural remission of his symptoms to the extent that has been the case. I feel inclined to believe that the serum has been of real benefit and he has reacted well thereto. He now talks rationally and is able to read and to take a general interest in life."

Another case under the care of Dr. Cole diagnosed as a case of Cerebral Syphilis by Dr. Ferrier of London has shown no reaction whatever to repeated administration by Serum No. 1 & No. 2.

Dr. Alexander Bruce recently asked me to see in Ward 32, of the Royal Infirmary, a case in which he suspected General Paralysis. I confirmed his opinion but offered to test the case with serum. There was

no reaction to the first injection, Serum No. I, but a second injection a few days later caused a rise of temperature to 103° F. which only subsided gradually during the next 5 days. Dr. Bruce is of opinion that the patient now shows distinct mental improvement and has very kindly given me permission to quote this case.

ANALYSIS of REACTIONS.

A study of the averages will show that Serum No. 1 and Serum No. 2 give approximately similar results in the 7 cases in which both were tried. Unfortunately on account of the scarcity of Serum No. 2, this comparison is necessarily far from being absolute, as the relative number of times in which the two sera were used is very disproportionate.

		<u>Max.</u>	<u>Time</u>	<u>Dur.</u>	<u>Pulse</u>
By injection	Serum No. 1	100.0°	17.6	41.3	9.9
	Serum No. 2	101.0°	21	55.3	10.3

shows the reactions of the two sera to be similar.

By Mouth	Serum No. 1	99.6°	19.1	38.5	4.8
	Serum No. 2	99.2°	5.6	11	6.6

shows that the temperature rise is almost similar, that Serum No. 1 is nearly 4 times longer in gaining maximum temperature and the duration is more prolonged.

~~Case No. 5 however probably accounts for this difference.~~

An analysis of the table of Averages for comparison (q.v.) of the sera shows that the reactions in each case tested were similar except that Case No. 6, though reacting similarly by injection had a better reaction by mouth to Serum No. 1 than to Serum No. 2. Cases Nos. 10 & 14 reacted better to Serum No. 2

To compare the relative advantage of the method of administration the following arrangement will bring out any contrast:-

	Max.	Time	Dur.	Pulse
Serum No. I Injection	100°	17.6	41.3	9
Mouth	99.6°	19.1	38.5	4.8
Serum No. 2 Injection	101°	21	55.3	10.3
Mouth	99.2°	5.6	11	6.6

Serum No. 1 is equally active by mouth or injection, except that the pulse by the latter method has an increase double that of mouth administration.

Serum No. 2 in every way appears to be more active by injection than by mouth.

The symptomatic effects of the Serum are no less striking than the temperature reactions in as much as they were present only in the cases of General Paralysis. They therefore constitute an additional and valuable aid to diagnosis, and were in order of greater frequency as follows:-

Flushing of face and Drowsiness. Giddiness and ataxia. Diaphoresis. Hilarious intoxication and voracious appetite. They were extraordinarily rapid in their appearance. "Tinglings", "pins and needles", and "numbness" were also complained of by patients. Rapid production of lucidity of mind was noticed in

the far advanced cases in addition to a temporary dissipation of tremor. Nausea, vomiting after injection or dose given by mouth, also diarrhoea, when given in the latter method, were frequently produced in the case of General Paralysis.

None of these phenomena were observed in the control cases.

Serum urticaria occurred in all the General Paralytics except Case 4, and all the controls except Control 8. It, however, never caused a pyrexia to complicate the experiments. No other effect occurred in the controls, save drowsiness in an Epileptic.

We have been fortunate in selecting sheep since the evil effects of the injection of Ox Serum into the human subject would have been disastrous to our experiment.

The negative reaction to Normal Sheep Serum has kindly been confirmed for me by Dr. L.C. Bruce of Murthly Asylum after seeing my cases which had been non-innoculated tested with the blood of the sheep. He informs me of a similar negative result to the injection of a polyvalent antistrepto-coccic serum.

CONCLUSIONS.

A perusal of the foregoing clinical records must, I think, convince us that the sera to which the cases have been subjected are specific to General Paralysis or some allied toxæmia at present indistinguishable by known clinical methods from that disease.

Some of the facts that serve to sustain this conviction are:-

1. A distinct temperature reaction has followed the administration of one or other or both of these sera in cases of General Paralysis.

This has not occurred in other cases of insanity selected for control.


2. The pulse-rate, as a rule, was increased in the General Paralytic cases but not usually in the controls, after administration of the serum.
3. Numerous symptomatic effects occurred in the cases of General Paralysis, that never showed themselves in the control cases, and were reproductions of symptoms commonly associated with the specific disease.

4. The effect of the serum on the mental state of the General Paralytic cases was striking in the extreme; while not the slightest alteration in it was to be observed in the cases selected for control.
5. The extraordinary improvement, both mental and physical, in the cases of General Paralysis that occurred after the more extended use of the serum is no less striking.

The controls were unaffected by this continuous administration.
6. It is a very significant fact that as the case of General Paralysis improved the reactions became relatively diminished.
7. The progressive and more severe cases of General Paralysis reacted more markedly than the non-progressive or remissional.
8. The non-progressive or remissional cases reacted only slightly, but did react.

9. The remote local effects are very suggestive:
Leucorrhoeal conditions being obviously affected by the serum to the patient's benefit. In a similar manner this was noticed in a Bronchial case.
10. The production of gastro-intestinal disturbances was strictly confined to the cases of General Paralysis.

Diarrhoea, nausea, vomiting or voracity being noticed only in the paralytics.
11. The fact that the same effects follow administration of the serum by the mouth as by injection determines its specificity.
12. Normal sheep serum injected into cases of General Paralysis caused no reaction whatever.
13. These reactions could not have been what is commonly known as "Serum disease", since they were strictly limited to the cases of General Paralysis: Urticaria and occasionally local inflammatory reaction being the only results in common to the controls and the General Paralytics.

14. My colleague, Dr. Alexander Russell has made a prolonged series of daily observations on the blood of some of the cases treated by serum, and has found that a leucocytosis occurs after administration of the serum only in the control cases: no demonstrable increase of leucocytes occurring in the General Paralytic cases. That the serum supplies some want to the economy of the leucocytes is an explanation that may account for this phenomenon.
- 

INJECTION

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	26 Sep.	1	1	5	0	0	0	0	0	"Stronger"
2	29 "	1	2	5	0	0	0	0	Slight Erythema	0
7	16 Oct.	1	1	5	99.4°	22 Hours	26 Hours	+18	0	Headache, Drowsiness Staggering
8	20 "	1	2	12½	99°	3	23	+16	Oedema & Erythema	0
9	30 "	1	1&3	20	98.8°	8½	12	0	0	0
10	6 Nov.	1	1&3	20	100.6°	7	23	+20	0	0
11	19 "	1	3&4	20	102°	6½	27	+20	Hard Swelling	Nausea & Vomiting
12	29 "	1	1	20	98.8°	11	23	+10	Swelling & Redness	0
13	7 Dec.	1	2	20	101°	19½	39½	+6	0	0
14	14 "	1	4	20	99.4°	3	23	+14	0	Vertigo
15	21 Dec.	1	1	20	100.6°	11	31	+20	0	0
16	29 "	1	1&2	20	0	0	0	0	(Serum Frozen)	0
17	5 Jan.	1	1&4	20	99.4°	19	23	+8	0	0
18	13 "	1	3	20	102.4°	9	53	+16	0	Immediate intoxication
19	18 "	1	1	20	99.4°	15	23	+16	0	Diaphoresis,
21	7 Feb.	1	1	20	100°	7	27	+10	Pain & swelling later abscess	0

Average for Serum No. 1
in doses of 20 c.c.

100.2°

10.6 "

27.6 "

+12.7

0

0

C A S E NO. 3 (continued)

BY MOUTH

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect
3	4 Oct.	1	1	7½	99°	8 Hours		+4	0	Urticaria
4	7 "	1	2	10	99.8°	20 "	44 "	+20	0	Congestive Seizure
5	11 "	1	1	7½	99°	12 "	16 "	+20	0	Very drowsy
6	13 "	1	2	5	0	0	0	0	0	0
22	25 Feb.	1	2&3	20	99.8°	10 "	18 "	0	0	Increased appetite Hilarity. Numbness.
23	2 Mar.	1	1	20	98.8°	4 "	4 "	0	0	Vertigo Diaphoresis
*24	11 "	1	4	20	0	0 "	0	0	0	Headache. Drowsiness
*25	18 "	1	4	20	98.6°	4½ "	4½ "	0	0	Nausea
*26	25 "	1	4	5	98.6°	5 "	5 "	0	0	Heat

Averages of Serum No. I
in doses of 20 c.c. 99° 4.7 6.3 0 0 0

* Food ingested immediately

20	26 Jan									
	Normal Serum	20 c.c.	0	0	0	0	0	0	0	0

INJECTION.

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	26 Sep.	1	1	5	98.8°	32½ Hours	36½ Hours	+26	0	Drowsiness. Vomited. Roused.
2	29 "	1	2	5	100°	23 "	51 "	+20	0	Excited.
7	13 Oct.	1	1	2½	99.6°	11 "	67 "	+12	0	Excited.
8	16 "	1	1	5	100°	26 "	38 "	+16	0	Drowsiness
9	20 "	1	4	7½	99.4°	23½ "	27½ "	+10	0	0
10	21 "	1	4	12½	99.8°	2 "	34 "	+24	0	Numbness. Dysphagi
11	24 "	1	1&3	20	99.2°	12 "	56 "	+6	0	"Pins & Needles"
12	30 "	1	2&4	15	99°	69 "	71 "	+16	0	0
13	3 Nov.	1	1&3	20	99.4°	22 "	30 "	+10	0	Tremulousness
14	6 "	1	1,3,4	20	99.8°	11 "	35 "	+16	0	Drowsiness. Impulsive.
15	* 11 "	0	5&6	20	0	0	0	0	0	0
16	16 "	1	1&5	20	98.6°	26 "	35 "	0	(Serum turbid)	Ataxy.
17	19 "	1	2&3	20	100°	6½ "	34½ "	+6	0	0
18	29 "	1	1	20	98.8°	16 "	28 "	+20	0	0
19	7 Dec.	1	2	20	99.8°	8 "	23 "	0	0	0
21	14 "	1	4	20	100°	48 "	156 "	+16	0	0
23	29 "	1	1&2	20	0	0	0	0	(Serum frozen)	Lucidity.
25	13 Jan.	1	3	20	100°	13 "	41 "	0	0	0
26	18 "	1	1	20	99°	11 "	24 "	+10	0	0
28	1 Feb.	1	3	20	100.6°	11 "	35 "	+16	0	Knitting.
29	7 "	1	1	20	100°	7 "	27 "	+10	0	0
Averages for Serum No. 1 in Doses of 20 c.c.					99.6°	15.9	43.6	+9		

BY MOUTH

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local	Reaction	General	Effect.
3	3 Oct.	1	2	2½	99.4°	8 Hours	16 Hours	+10	0	0	0	
4	4 "	1	1	7½	100°	5	24	+6	0	0	0	Drowsy.
5	7 "	1	2	10	100°	24	28	+16	0	0	0	Excited.
6	11 "	1	1	7½	99.2	8	34	+26	Vomited			Drowsy.
20	8 Dec.	1	2	15	99.2°	1½	23	8	0	0	0	Reading
22	21 "	1	3	10	99°	11	35	+20	0	0	0	0
24	5 Jan.	1	1,2&4	20	99.4°	7	11	0	0	0	0	0
30	18 Feb.	1	3	20	99.4°	8	36	0	0	0	0	"Sick & dizzy."
31	25 "	1	2	20	100.2°	2	62	+20	0	0	0	Flushing & Exhilaration.
32	2 Mar.	1	4	20	100°	28	56	+10	0	0	0	Restlessness & Confusion.
33	11 "	1	2	20	98.8°	1½	8½	+6	0	0	0	Nausea.
34	18 "	1	4	20	99.4°	4	22	+4	0	0	0	0
35	25 "	1	3	5	0	0	0	+10	0	0	0	0
Averages for Serum No. I in doses of 20 c.c.					99.5°	8.2	32.5	+6.6.				

27 28 Jan. 10 8 20
(Normal Serum)

0

0

0

0

0

0

INJECTION.

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local	Reaction	General Effect
1&2	24 Oct.	1	1&3	25	100.2°	20 Hours	108 Hours	+24		0	Lucidity
3	30 "	1	1&3	20	99.6°	16½	24½	+12		0	0
4	3 Nov.	1	1&3	10	99.2°	14	58	+20		0	0
5	6 "	1	1&3	20	100.4°	3	104	+16		0	Pains better. Bed-sore healed. Can walk with support.
6	11 "	1	3&4	20	100°	7	35	+20		0	Emotional
7	19 "	1	3&4	20	100°	6½	30½	+16		0	0
8	24 "	1	1&2	20	102°	106	126	+18		0	0
9	29 "	1	1	20	99.°	11	27	0		0	General Improvement 14 lbs. gain in weight.
10	7 Dec.	1	2	20	100°	15½	39½	+10		0	0
11	14 "	1	4	20	100°	7	23	0		0	0
12	21 "	1	1	20	101°	11	115	+14		0	0
13	29 "	1	1&2	20	102°	151	167	+16		0	0
14	5 Jan.	1	1&4	20	101.2°	19	59	0		0	0
15	13 "	1	3	20	99.8°	9	39	0		0	0
16	18 "	1	2	20	103.4°	43	75	+4		0	Flushing & Emotional
18	1 Feb.	1	3	20	101°	11	51	+14		0	Walking unsupported
19	7 "	1	1	20	100.8°	15	85	+12		0	0
Averages for Serum No. I in doses of 20 c.c.					100.5°	27.8	68.6	+11.5		0	0

Doses of 24 Oct & 3 Nov. reckoned as 2 of 20 c.c.

CASE NO. 5 (continued.)

BY MOUTH.

No.	Date	B.	S.	C.C.	Maximum	Time	Duration.	Pulse-rate	Local Reaction	General Effects
20	18 Feb.	1	3	20	100°	8 Hours	32 Hours	+16	0	Congestion in head Inebriated
21	25 "	1	2	20	102.2°	66 "	98 "	+12	0	0
22	2 Mar.	1	1	10	98.6°	5 "	5 "	+12	0	Appetite +, Urticaria. Diaphoresis. Giddiness & Drowsiness.
23	11 "	1	4	20	102.2°	37 "	151 "	+8	0	
* 24	18 "	1	1	10	98.6°	8½ "	36 "	+12	0	Giddiness.
25	25 "	1	4	5	100°	109 "	109 "	+8	0	Drowsiness.
Averages of Serum No. 1 in doses of 20 c.c.					101.4°	37	93.6	+12	0	0

* FOOD INGESTED IMMEDIATELY.

17 28 Jan. 0 8 20 0 0 0 0 0
(Normal Serum)

CASE NO. 6

INJECTION.

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local	Reaction	General	Effects
1	24 Oct.	1	1&3	20	99.4°	20 Hours	36 Hours	+8	0	0	0	
2	31 "	1	1&3	20	99.2°	21½ "	25 "	0	0	0	0	Restless
3	3 Nov.	1	1&3	20	99.4°	14 "	36 "	+10	0	0	0	Talkative
4	6 "	1	1&3	20	99.6°	20 "	27 "	+10	0	0	0	Excited
5	* 11 "	0	5&6	20	0	0	0	0	0	0	0	0
6	16 "	1	1&3	20	99°	6 "	14 "	+12	0	0	0	0
7	19 "	1	3&4	20	99.6°	6½ "	34½ "	+6	0	0	0	Restless
8	29 "	1	1	20	99°	13 "	23 "	+4	0	0	0	0
9	7 Dec.	1	2	20	99.4°	12 "	28 "	+4	0	0	0	0
10	14 "	1	4	20	100°	3 "	23 "	0	0	0	0	0
11	21 "	1	3	20	99.8	11 "	27 "	+8	0	0	0	0
12	5 Jan.	1	4	20	101°	7 "	35 "	+8	0	0	0	0
13	13 "	1	2	20	103°	9 "	37 "	+32	0	0	0	0
14	18 "	1	1	20	98.8°	12 "	44 "	+6	0	0	0	0
Averages of Serum No. I in doses of 20 c.c.					99.7°	11	29.9	+8.3				

* 5 11 Nov. NORMAL SERUM

Getting up
and able
to knit

(continued)

BY MOUTH

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local	Reaction	General	Effects
18	18 Feb.	1	3	20	99.6°	11 Hours	27 Hours	+ 8		0		0
20	2 Mar.	1	4	20	101.2°	12 "	64 "	+ 0		0	Nausea	
21	11 "	1	2	20	99.4°	36 "	40 "	+ 6		0		0
22	18 "	1	4	20	100°	8 "	16 "	+ 0		0		0
23	23 "	1	3	5	101°	9 "	41 "	+ 6		0		0
Averages of Serum No. I in doses of 20 c.c.					100°	16.7	36.7	+ 5.5				

INJECTION

No.	Date	B.	S.	C.C.	Maximum	Time	Dur.	Pulse-rate	Local Reaction	General Effects
16	1 Feb.	2	5	20	100°	11 Hours	51 Hours	+2	0	0
17	7 "	2	5	20	100°	7 "	19 "	+12		
Averages of Serum No. I in doses of 20 c.c.										
					100°	93	135	+17	0	0

BY MOUTH

[illegible]

C A S E NO. 7

INJECTION

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effects.
2	7 Feb.	1	2	15	103.6°	11 Hours	75 Hours	+16	0	Thirst. Vomiting
10	8 Apr.	1	3	20	101°	30½	" 74½	+24	0	Flushing & Increase of tremor.

BY MOUTH

No.	Date	B.	S.	C.C.	Maximum	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
3	18 Feb.	1	2	20	99.6°	12 Hours	108 Hrs.	+10	0	Thirst. Pallor
4	25 "	1	2	20	99.8°	14	" 38	+4	0	Thirst. Cold
5	2 Mar.	1	4	20	98.8°	4	" 8	0	0	Giddiness & Diarrhoea.
6	11 "	1	3	20	98.6°	4	" 12	0	0	0
7	18 "	1	1&4	20	99°	12½	" 16½	+6	0	0
8	25 "	1	3	5	98.6°	5	" 9	0	0	0
9	1 Apr.	1	1	20	98.8°	27	" 27	+16	0	0

Averages for Serum No. I
in doses of 20 c.c.

99.1°	12.2	34.9	+6
-------	------	------	----

INJECTION

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
1	1 Feb.	2	5	20	101.2°	23 Hours	43 Hours	+24	0	0

C A S E NO. 8

INJECTION

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	4 Feb.	1	2	20	99.4°	11 Hours	43 Hours	+8	Slight Swelling	0
2	7 "	1	1	20	100°	11 "	23 "	+12	Urticaria	
4	24 "	1	1	20	99°	2 "	10 "	+4		Hilarity. Diaphoresis. Voracity.
Averages of Serum No. I in doses of 20 c.c.					99.4°	8 "	25 "	+8		

BY MOUTH										
No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
3	18 Feb.	1	3	20	99.6°	12 Hours	28 Hours	0	0	Diaphoresis.
5	2 Mar.	1	4	20	* 98.6°	4 "	8 "	0	0	Nausea. Diarrhoea.
6	11 "	1	3	20	98.6°	7 "	"	+6	0	
8	25 "	1	4	5	98.6°	0 "	0 "	0	0	
Averages of Serum No. I in doses of 20 c.c.					98.9°	7.6	14.3	+2		

BY MOUTH										
No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
7	18 Mar.	2	5	20	98.6°	3 Hours	9 Hours	+6	0	0

* Patient had greatly improved and practically ceased to react.

C A S E NO. 9

INJECTIONS.

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effects.
1	4 Feb.	1	2	20	101°	7 Hours	47 Hours	+12	0	0
2	7 "	1	4	20	101°	7 "	31 "	+10	0	Urticaria
Averages of Serum No. I in doses of 20 c.c.					101°	7	39	+11	0	0

MOUTH										
No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect
3	18 Feb.	1	2&4	20	100.4°	8 Hours	32 Hours	+6	0	Urticaria & Dizziness
5	2 Mar.	1	4	20	99.2°	8 "	12 "	0	0	Inebriated. Diaphoresis
6	11 "	1	2	20	100°	8 "	20 "	+8	0	0
Averages of Serum No. I in doses of 20 c.c.					99.8	8	21.3	+4.6		

BY MOUTH.										
No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect
4	28 Feb.	2	6	20	100°	8 Hours	18 Hours	+6	0	Inebriated.
7	18 Mar.	2	5&6	15	100°	8½ "	12½ "	+10	0	0

C A S E NO. 10

INJECTION.

(Temperature over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect.
1	7 Feb.	1	4	20	99.4°	11 Hours	31 Hours	+8	0	Urticaria. Excited.
4	28 "	1	1	20	101°	22 "	38 "	+4	0	0
7	25 Mar.	1	2	20	100.6°	8 "	20 "	+10	0	Diaphoresis profuse.
Averages of Serum No. I in doses of 20 c.c.					100.3°	13.6	29.6	+7.3		

BY MOUTH.

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect
2	18 Feb.	1	3	20	100°	8 Hours	20 Hours	0	0	Headache. Diaphoresis
3	25 "	1	2&4	20	100°	6 "	50 "	+10	0	Profuse Diaphoresis.
5	11 Mar.	1	2	20	99.2	4 "	12 "	0	0	0
Averages of Serum No. I in doses of 20 c.c.					99.7°	6 "	27.3	+3.3		

INJECTION (Serum No. 2)

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
6	18 Mar.	2	5	20	102°	30 Hours	88 Hours	0	0	0

CASE NO 11

INJECTION.

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
2	17 Mar.	1	4	20	99°	32 Hours	36 Hours	0	0	"Tingly" Drowsy. Polyuria. Menstruation
3	25 "	1	3	20	100.6°	36 "	96 "	0	Slight redness Swelling.	Inebriation & Urticaria
4	1 Apr.	1	4	20	100°	8 "	40 "	+10	0	"Tinglings"
Averages of Serum No. I in doses of 20 c.c.					99.8°	25.3	57.3	+3.3		

BY MOUTH

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
1	11 Mar.	1	3	20	98.8°	32 Hours	64 Hours	+10	0	"Dizziness" Drowsy.
5	8 Apr.	1	3	20	99.4°	31 "	45 "	+10	0	Headache Hunger
Averages of Serum No. I in doses of 20 ".					99.1°	31.5	54.5	+10		

C A S E NO. 12

INJECTION

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	20 Feb.	1	2	20	99.8°	36 Hours	44 Hours	+ 4	0	"Shivering"
2	25 "	1	1	20	100°	38 "	50 "	+ 4	0	"Pains"
Averages of Serum No. I in doses of 20 c.c.					99.9°	37	47	+ 4		

BY MOUTH

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
3	2 Mar.	1	4	20	99.6°	60 Hours	64 Hours	0	0	Diarrhoea. Hunger
5	18 "	1	1	20	0	0	0	0	0	Diaphoresis.
6	25 "	1	3	5	0	0	0	0	0	Diarrhoea & Diaphoresis.

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect
4	11 Mar.	2	6	7½	98.4°	4 Hours	12 Hours	0	0	Inebriation & Diaphoresis

INJECTION

C A S E NO. 13

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	18 Mar.	1	4	20	99.4°	8 Hours	32 Hours	+10	0	0
2	25 "	1	2	20	99.2°	12 "	16 "	+4	0	0
3	1 Apr.	1	4	20	99.2°	8 "	16 "	+6	0	0
Averages of Serum No. I in doses of 20 c.c.					99.3°	9	21	+7		

INJECTION. (Serum No. 2)

No.	Date	B.	S.	C.C.	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
4	8 Apr.	2	5	20	98.8°	8 Hours	12 Hours	+18	0	Nausea

C A S E NO. 14.

INJECTION

Temperature (over 98.4°)

No.	Date	B.	S.	C.C.	Maximum	Time	Duration	Pulse-rate	Local Reaction	General Effect
1	18 Mar.	1	4	20	99°	24 Hours	28 Hours	+10	0	0
2	25 "	1	3	20	98.6°	28 "	32 "	0	0	0
3	1 Apr.	1	4	20	99.6°	28 "	36 "	+6	0	0
Averages of Serum No. I in doses of 20 c.c.					99°	26	32	+5		

INJECTION

No.	Date	B.	S.	C.C.*	Max.	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
4	8 Apr.	2	5	20	100.6°	8 Hours	20 Hrs.	10	0	Profuse Diaphoresis

* Pyrexia prolonged over 8 days.

AVERAGES FOR COMPARISON.

SERUM N° 1 (Sheep 1,2,3,4)

SERUM N° 2 (Sheep 5,6)

CASE		MAXIMUM	TIME	DURATION	PULSE	MAXIMUM	TIME	DURATION	PULSE	
3	I	100.2°	10.6	27.6	+12.7					
	M	99°	4.7	6.3	0					
"	I	99.6°	15.9	43.6	+9					
	M	99.5°	8.2	32.5	+6.6					
"	I	100.5°	27.8	68.6	+11.5					
	M	101.4°	37	93.6	+12					
"	I	99.7°	11	29.9	+8.3	100°	9	35	+7	I
	M	100°	16.7	36.7	+3.5	99.2°	6	14	+6	M
"	I	102.3°	21	75	+20	101.2°	23	43	+24	I
	M	99.1°	12.2	34.9	+6					M
"	I	99.4°	8	25	+8					I
	M	98.9°	7.6	14.3	+2	98.6°	3	9	+6	M
"	I	101°	7	39	+11					I
	M	99.8°	8	21.3	+4.6	100°	8	10	+8	M
"	I	100.3°	13.6	29.6	+7.3	102°	30	88	0	I
	M	99.7°	6	27.3	+3.3					M
"	I	99.8°	25.3	57.3	+3.3					
	M	99.1°	31.5	54.5	+10					
"	I	99.9°	37	47	+4					
	M	99.6°	60	64	0					
"	I	99.3°	9	21	+7	98.8°	8	12	+18	I
	M									M
"	I	99°	26	32	+5	100.6°	8	20	+10	I
	M									M

TOTAL N° 1 gave an average rise of 100° } INJECTION
 AVERAGES N° 2 " " " " " 101° }
 IN 14 CASES N° 1 " " " " " 99.6° } MOUTH
 N° 2 " " " " " 99.2° }

C O N T R O L N O . I

Temperature (over 98.4°)

*

No.	Date	Bac.	Sheep	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local	Reaction	General	Eff.
1	6 Oct.	1	1		X	2	0	0	0	+16		0	0	0
2	10 "	1	2		X	2½	0	0	0	0		0	0	0
3	11 "	1	1		X	2½	0	0	0	0		0	0	0
4	17 "	1	1		X	1½	0	0	0	0		0	0	0
5	20 "	1	3	X		2½	0	0	0	0		0	0	0
6	23 "	1	3&4		X	5	0	0	0	0		0	0	0
7	24 "	1	1&3	X		15	0	0	0	0		0	0	0
8	30 "	1	1&3	X		15	0	0	0	+30		0	0	0
9	6 Nov.	1	1&3	X		15	0	0	0	+12		0	0	0
10	11 "	1	3&4	X		20	0	0	0	0		0	0	0
11	15 "	1	1&3		X	10	0	0	0	0		0	0	0

* "Irritable heart" of mania, resistive excitement and constipation.

C O N T R O L NO. 2

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local Reaction	General Effect
1	5 Dec.	1	1		X	20	0	0	0	0	0	0
2	7 "	1	2	X		20	0	0	0	0	0	0
3	8 "	1	3		X	15	98.6°*	0	0	+ 4	0	0
4	14 "	1	4	X		20	0	0	0	0	0	0
5	21 "	1	1	X		20	0	0	0	+10	0	0
6	5 Jan.	1	1&4	X		15	0	0	0	0	0	0
7	13 "	1	2	X		20	0	0	0	+16	Redness & Swelling.	0
8	18 Jan.	1	1	X		20	0	0	0	0	0	0
9	7 Feb.	2	6	X		20	0	0	0	0	0	0
10	20 "	1	3	X		20	0	0	0	0	0	0

* 55 c.c. given within a period of 72 hours.

C O N T R O L NO. 3

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local	Reaction	General	Eff.
1	15 Feb.	1	4	X		20	0	0	0	-7	0		Urticaria	
2	28 "	1	1		X	20	0	0	0	-10	0		0	
3	18 Mar.	2	5	X		20	0	0	0	0	0		0	

CONTROL NO. 4

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Max.	Time	Dur.	Pulse-rate	Local	Reaction	General	Effect.
1	21 Mar.	2	5		X	10	98.8°	* 65½	Hours 0	0		0	0	
2	25 "	1	2	X		20	0	0	0	0	0	0	0	
3	1 Apr.	1	1	X		20	0	0	0	+ 4	0	0	Urticaria	
4	8 "	2	5	X		20	0	0	0	0	0	0	0	

* Masturbation.

C O N T R O L NO. 5

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local Reaction	General Effect.
1	18 Mar.	1	4	X		20	0	0	0	+4	0	Fits
2	21 "	2	5		X	20	98.6°	58 Hrs.	0	-12	0	Drowsy
3	25 "	1	2	X		20	0	0	0	0	0	0
4	1 Apr.	1	1	X		20	0	0	0	-6	0	Urticaria

C O N T R O L (?) NO. 6

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local	Reaction	General	Effect.
1	25 Mar.	1	2	X		20	99.2°	36 Hrs.	0	46	0		0	
2	1 Apr.	1	1	X		20	0	0	0	0	0		0	
3	8 "	2	5	X		20	98.8°	48 Hrs.	0	0	0		0	

C O N T R O L NO. 7

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local	Reaction	General	Effect
1	25 Mar.	1	2	X		20	0	0	0	0	0	0	0	0
2	1 Apr.	1	1	X		20	100° *	55 Hrs.	87 Hrs.	+ 10	Severe inflammation.	Malaise.		
3	8 "	1	4		X	20	0	0	0	+ 20	0	0	0	0
4	15 "	1	2		X	20	0	0	0	0	0	0	0	0

* Dropped 8 Points in first three hours.

CONTROL NO. 8

Temperature (over 98.4°)

No.	Date	B.	S.	Inj.	Os	C.C.	Maximum	Time	Dur.	Pulse-rate	Local	Reaction	General	Effect
1	25 Mar.	1	2	X		20	0	0	0	-8		0	0	
2	1 Apr.	1	1	X		20	0	0	0	0	0	0	0	
3	"	2	5	X		20	0	0	0	0	0	0	0	
4	15 "	1	2		X	20	0	0	0	0	0	0	0	